OCTOBER 7, 1961

Chemical Week

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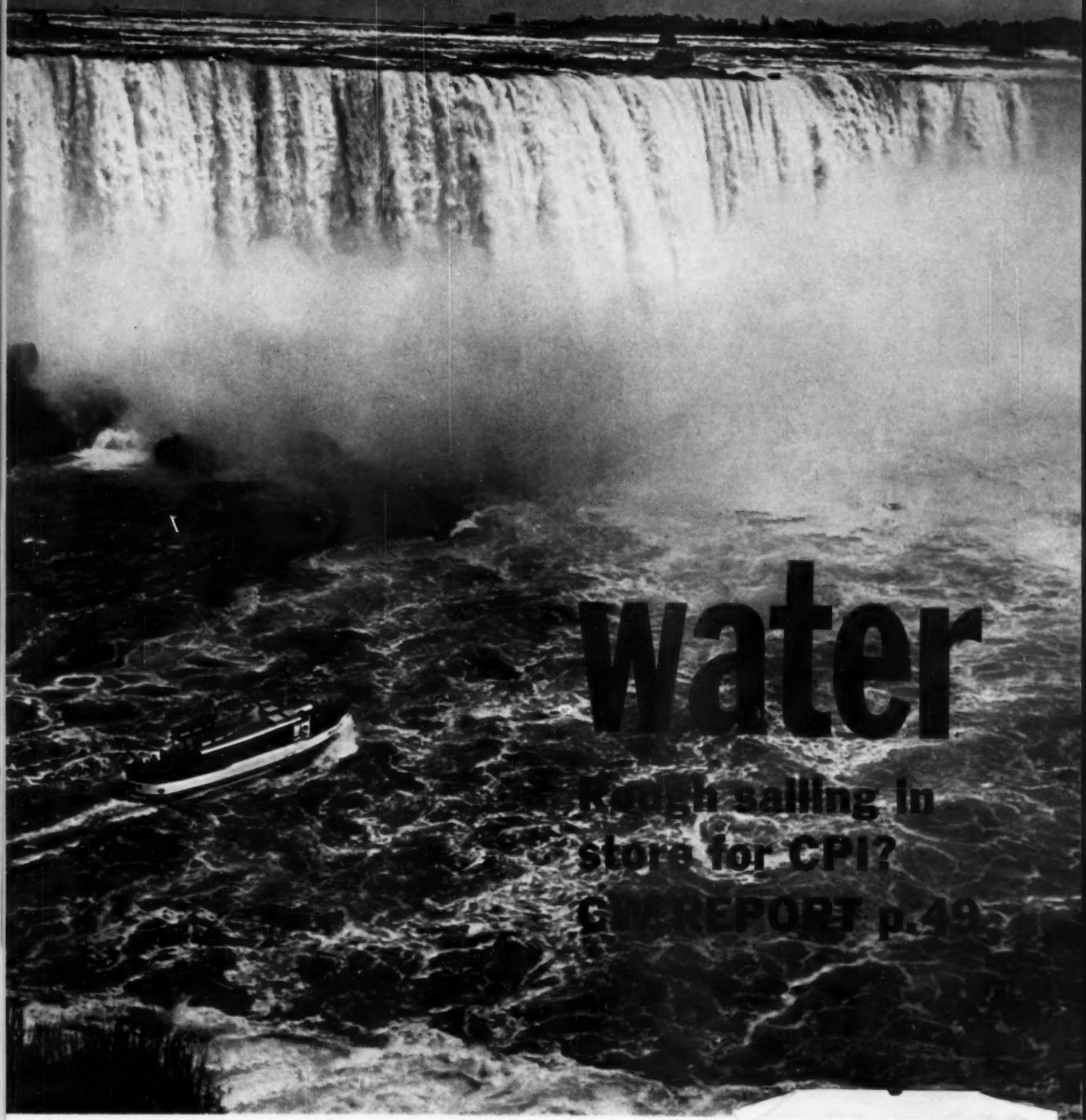

water

Rough sailing in store for CPI?

GIANT REPORT p.49

New glycerin producer; OM makes its move ....p. 31
Cut control costs; keep product quality .....p. 97

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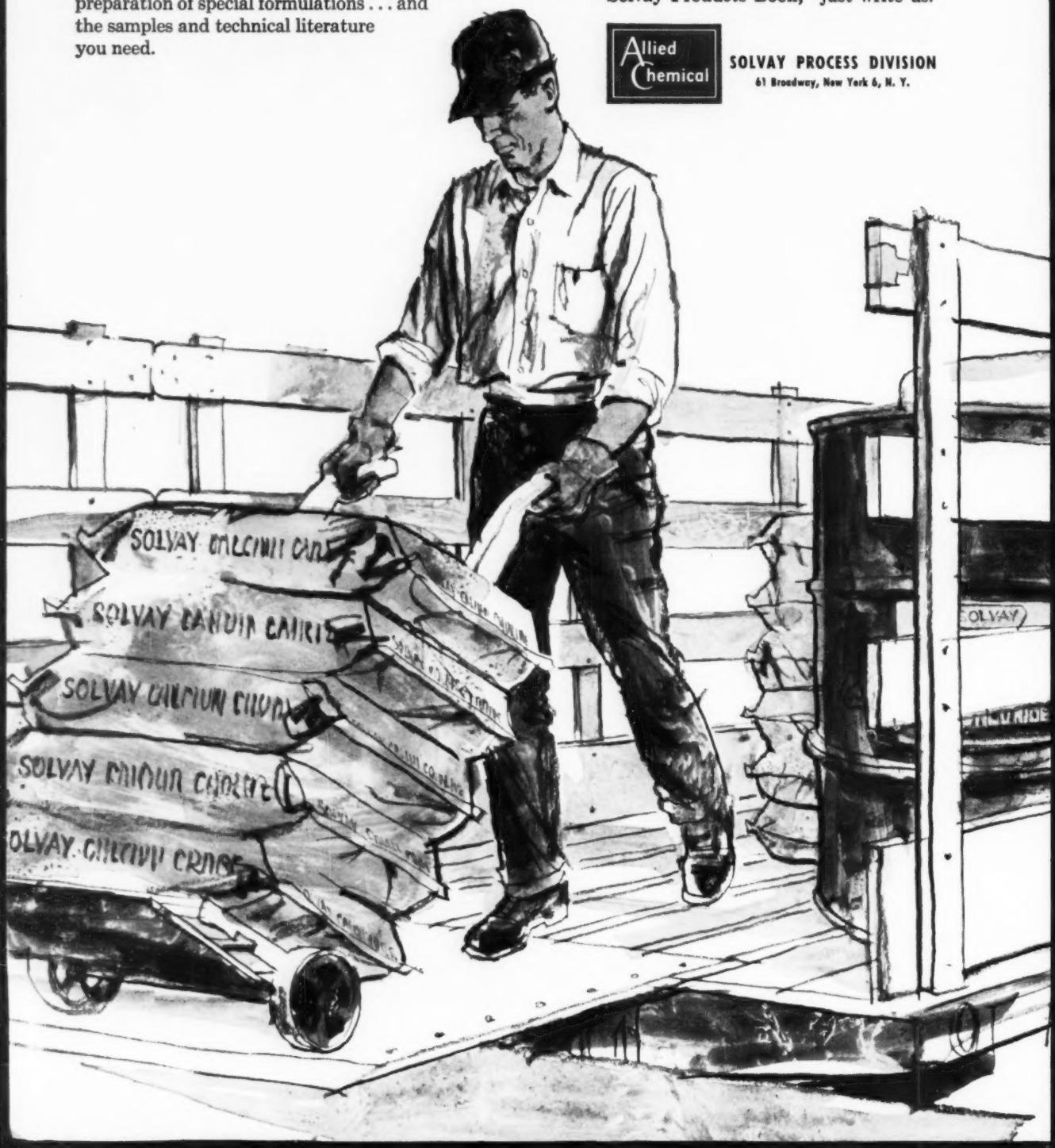
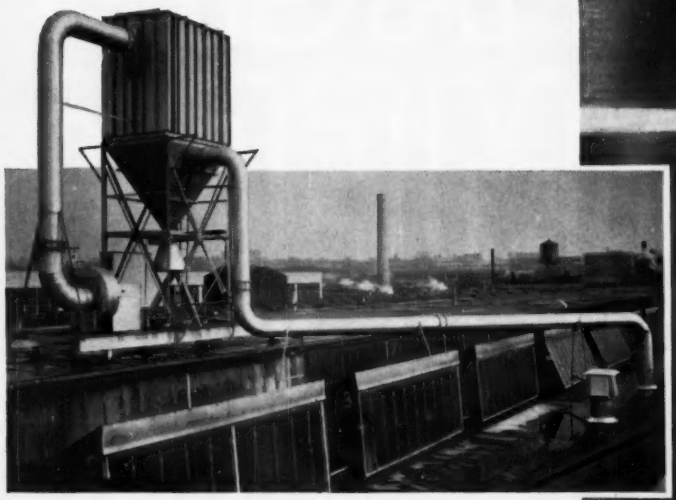
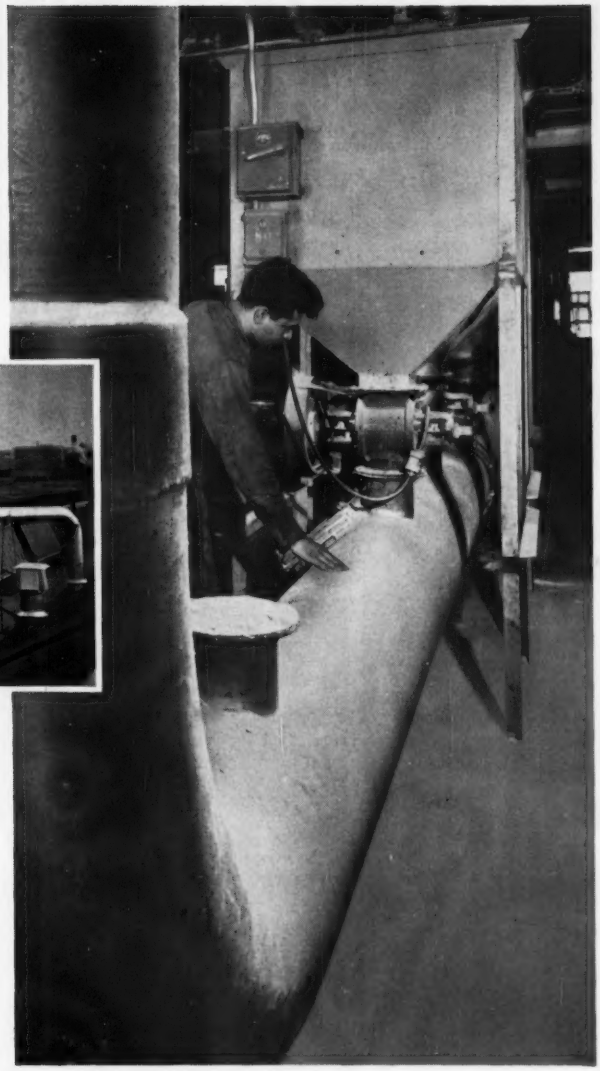


Blended PVC is discharged from surge tanks and cooled to 100°F. enroute to the roof-mounted Multi-Bag Filter by the air in the 18″ pipeline. Dracco also supplied Circle with an Airstream Conveyor which automatically moves PVC to maintain working levels in extruder hoppers.





creative engineering from Dracco:

one dust collector does three jobs

In terms of plant operation, modern stands for simple, time-saving, economical, serviceable. When a plant is being modernized, it often takes creative engineering to design equipment which fits this description.

Take the case at Circle Wire & Cable Corporation, for instance. The Circle plant in Maspeth, New York, extrudes cable sheathing made from PVC. Dracco engineers were asked to design a system which would modernize the existing operation of moving PVC compound from blending bins to a cooler, then storing it in 55-gallon drums for further handling to extruders.

Here's the result: the cooling tank was eliminated; manual transfer of PVC compound from blender to cooler was also eliminated; and 55-gallon drums are no longer needed to store standard extrusion blend. In their place stands a Dracco Multi-Bag Filter with an 18″ intake line. The air in the line conveys the blend and, as an extra feature, cools it enroute. The filter collects the compound and discharges it to a ready bin for further conveying to extruder hoppers. Continuous flow of material improves quality . . . elimination of extra equipment and manual handling saves space and cost.

If you are modernizing a process involving dry bulk handling or dust control, take advantage of Dracco's creative engineering. For more information, call or write Dracco Division of Fuller Company, Harvard Avenue at East 116th Street, Cleveland 5, Ohio.

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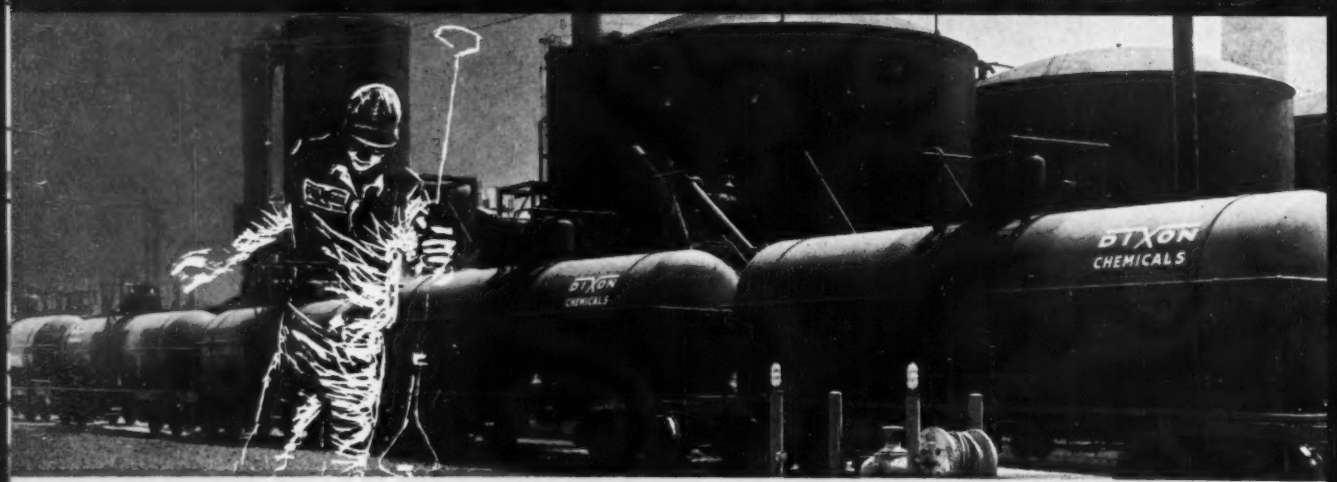

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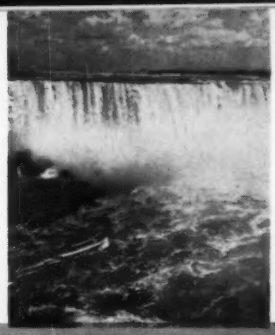

ON THE COVER: The CPI's thirst for water is symbolized in Humble Oil & Refining's photo of Niagara Falls. For a sweeping review of the U.S. water situation, see p. 49.

Chemical Week

Vol. 89, No. 14 OCTOBER 7, 1961

5 **VIEWPOINT—A philosophy of marketing; a caution on beryllium.**

25 BUSINESS NEWSLETTER

30 **CPI labor's advance guard starts campaign for merger of four main unions.**

31 Olin firms up plans for 40-million-lbs./year glycerin plant.

32 Chemical products crowd top of U.S. business' fast-growth item list.

32 Newest entry in monosodium glutamate: Commercial Solvents.

33 American Metal will base new chemical ventures on chlorine, potassium nitrate.

33 Industrial and economic gains to be sought by new agency for Atlantic nations.

33 Metal & Thermit-Udylite merger to accentuate coatings, metal plating.

39 **SPECIALTIES—New chemicals, equipment bid for forest fire-fighting markets.**

41 UCC alters its aerosol gas marketing to include hydrocarbon blends.

45 WASHINGTON NEWSLETTER

49 **CW SPECIAL REPORT: WATER—resources, distribution, pollution control.**

83 TECHNOLOGY NEWSLETTER

89 **RESEARCH—Probers zero in on refractory-metal oxidation problems.**

97 **PRODUCTION—Here's how to save 75% on quality control testing costs.**

105 MARKET NEWSLETTER

111 **MARKETS—Ammonium nitrate blasts out bigger share of explosives market.**

117 **ADMINISTRATION—Prearbitration wins new favor as route to labor peace.**

127 Cyanamid takes plunge into network TV; Olin backs educational TV.

127 Monsanto, OCAW settle on two-year labor contract.

132 BUSINESS BENCHMARKS

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What Are You Selling?

ARE YOU SELLING dynamite or are you selling holes in the ground? Are you selling acrylic lacquers or are you selling durable, easy-to-clean surfaces? Your answer depends on whether you are product-oriented or consumer-oriented.

The railroads are in serious trouble today largely because their managers thought of themselves as being in the railroad business rather than the business of transportation. Similarly, if the big Hollywood studios had thought of themselves as being in the business of entertainment rather than the making of movies, they wouldn't have been so troubled by TV.

It isn't as easy to pin down the consumer orientation of the chemical process industries since their exertions eventually, and often indirectly, satisfy a whole spectrum of consumer wants. But this much is clear: the customer—whether it be a housewife, another chemical company or a textile mill—is not buying products; it's buying properties. And if a totally different product with superior properties comes along, the consumer will buy it.

The chemical industry is less susceptible than many others to marketing myopia because it has learned the hard way the inevitability of product obsolescence. But companies can tie themselves too closely to particular raw materials as well as to particular products.

That is why many of the mergers in recent years are smart moves. They provide a more diversified reservoir from which to provide superior gratification of consumer needs.

The Beryllium Bubble

ALMOST EVERY MONTH or two for the past few years there has been a news item about beryllium—a new ore source, a new processing plant, an optimistic market forecast, or a hint of a forthcoming technological breakthrough. We fear that this rash of activity has created an aura of imminent spectacular growth that is hardly supported by the facts (*CW Washington Newsletter, Sept. 2*).

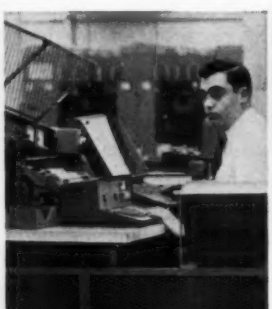
We have no desire or intent, of course, to belittle the progress that has been made, particularly in refining domestic ores. But any process of making beryllium oxide, whether by flotation or chemical means and no matter how economical, is almost without effect on the cost of the metal. Why? Fabricated metal parts sell in the hundreds-of-dollars-per-lb. range. Only about 5% of that cost is chargeable to obtaining pure beryllium oxide; another 20% represents production of the metal from oxide; but 70% goes to fabrication. High cost of fabrication is due to the great difficulty of working the metal, due to brittleness, and the infeasibility of reworking scrap.

The upshot is that the only areas in which any sizable price reductions can be brought about are in reduction and fabrication. Even if the oxide were given away, the price of finished parts—with currently used technology—couldn't be cut more than 5%. And it's pretty clear that large markets for the metal won't develop until the price of parts can be reduced considerably.

There's a lesson, we think, for readers and editors alike: a cacophony of publicity seems strangely to resolve itself into an aria that goes, "Wonder metal, wonder metal, wonder metal. . ." It's happened before and we're sure it will happen many times again.

Inventory Management Simulator program at...

Clark Equipment... improves custome



■ **High-capacity memory.** Two IBM 305 Data Processing Systems with RAMAC keep track of 75,000 replacement and repair parts in Clark's Chicago parts warehouse. ■ **The computer has the facts.** As soon as shipments arrive at the warehouse, an operator, using this remote inquiry station near the loading platform, finds out from the computers where various items go. ■ **Customer service first.** Using this remote inquiry station in the sales department, the operator gets information from the computer while the customer is on the phone.

Clark Equipment Company has prepared a co puter program called an Inventory Manag ment Simulator. The program allows Cla management to study the possible effects of d cisions on future customer service and futu warehouse profitability. When manageme gets the computer's report, it is in a position make new rules for the operation of its par warehouse.

Here's what's happened since Clark put t new program into operation:...improved cu tomer service...practically eliminated bac order problem . . . reduced the putaway ti for incoming material by more than 50 per ce ... reduced emergency order shipping time 50 per cent... enabled a physical inventory be taken without any interruption of serv to customers.

ervice...with less inventory

vailability highest ever. Inventory management a complex job at Clark. Its Chicago ware-ouse is one of the busiest and largest in the ountry. Before the Simulator program was eveloped, the warehouse carried an inventory 85,000 individual replacement and repair arts. Use of the program helped transfer the vestment in inventory to those parts most equently called for, giving high availability ith less investment.

anagement Operating System.* Clark installed vo IBM 305 Data Processing Systems with MAC.® These computers store, update, and fer on an instant's notice information on al-ost every aspect of the warehouse operation cluding complete information on every one of e 75,000 items maintained in stock.

Now, Clark is assured of maintaining just the right level of stock for each item. The procurement formulas, developed from the Inventory Management Simulator, even recommend how large a purchase order should be placed for each item and where it should be placed.

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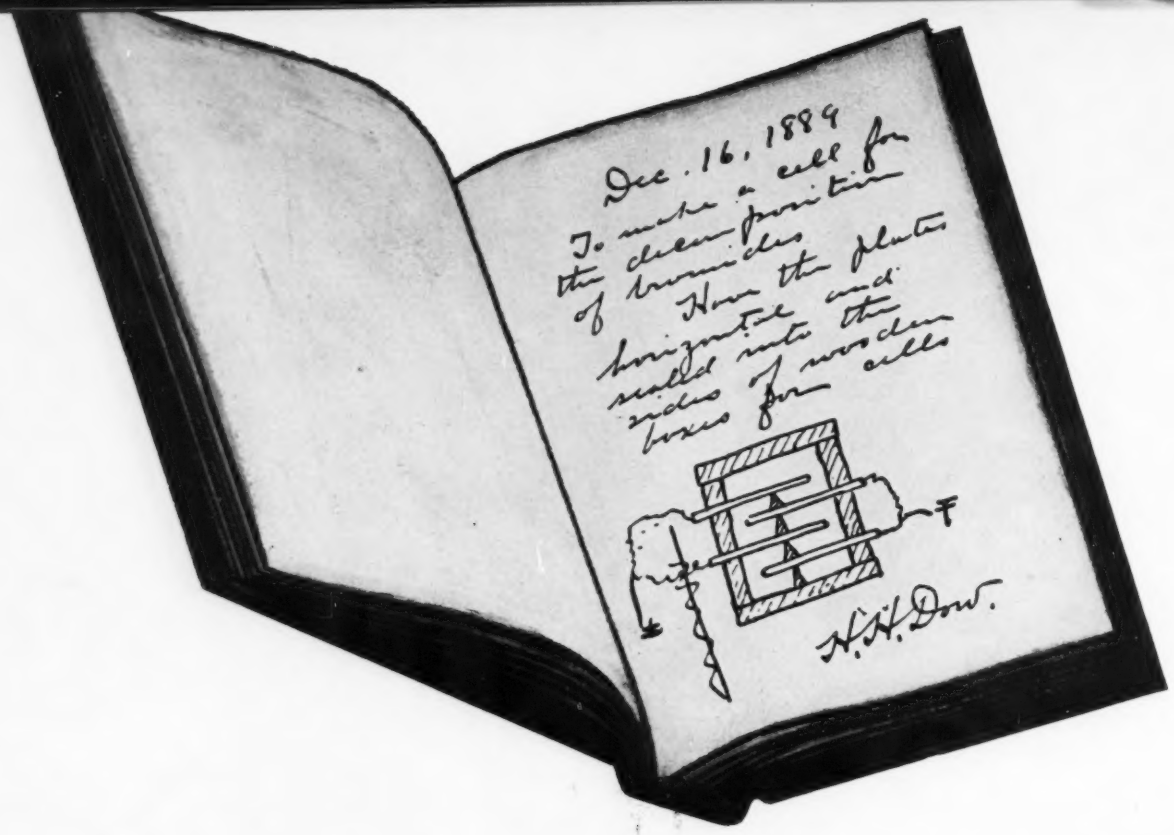

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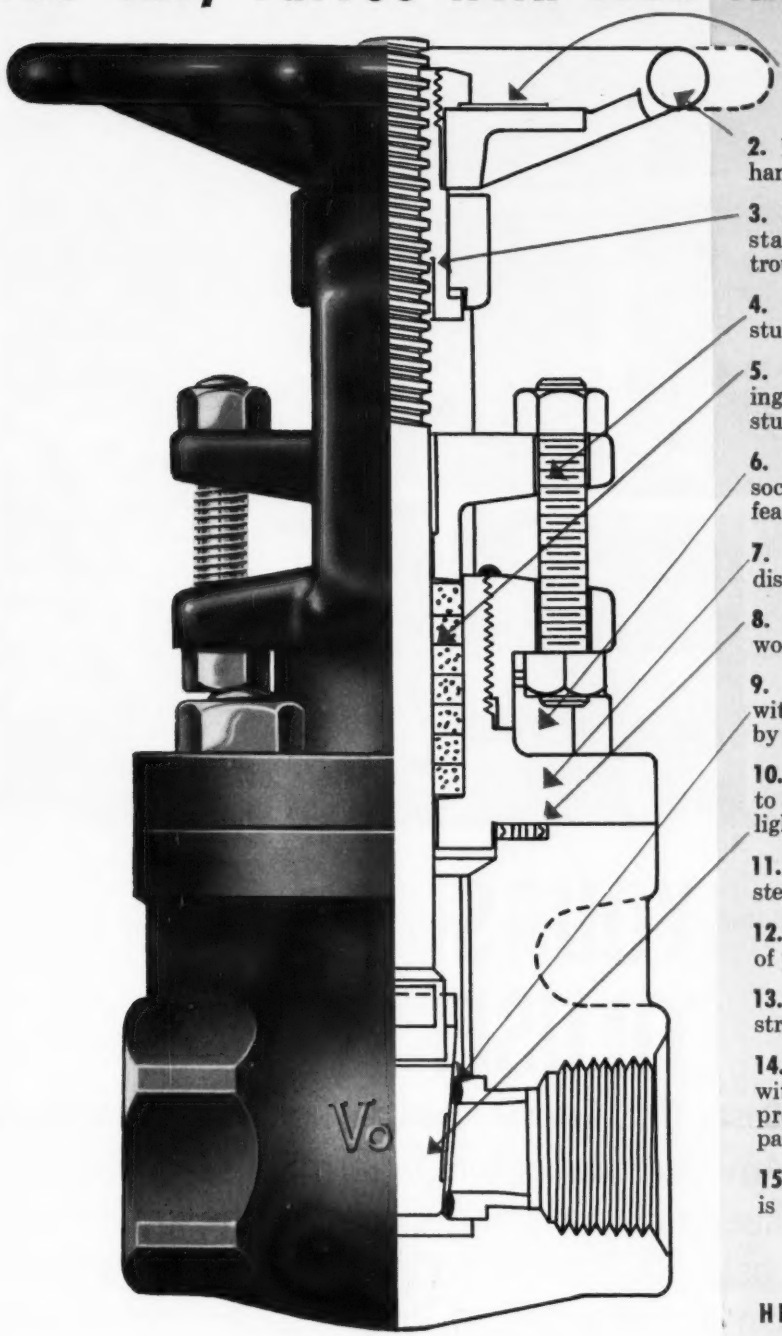

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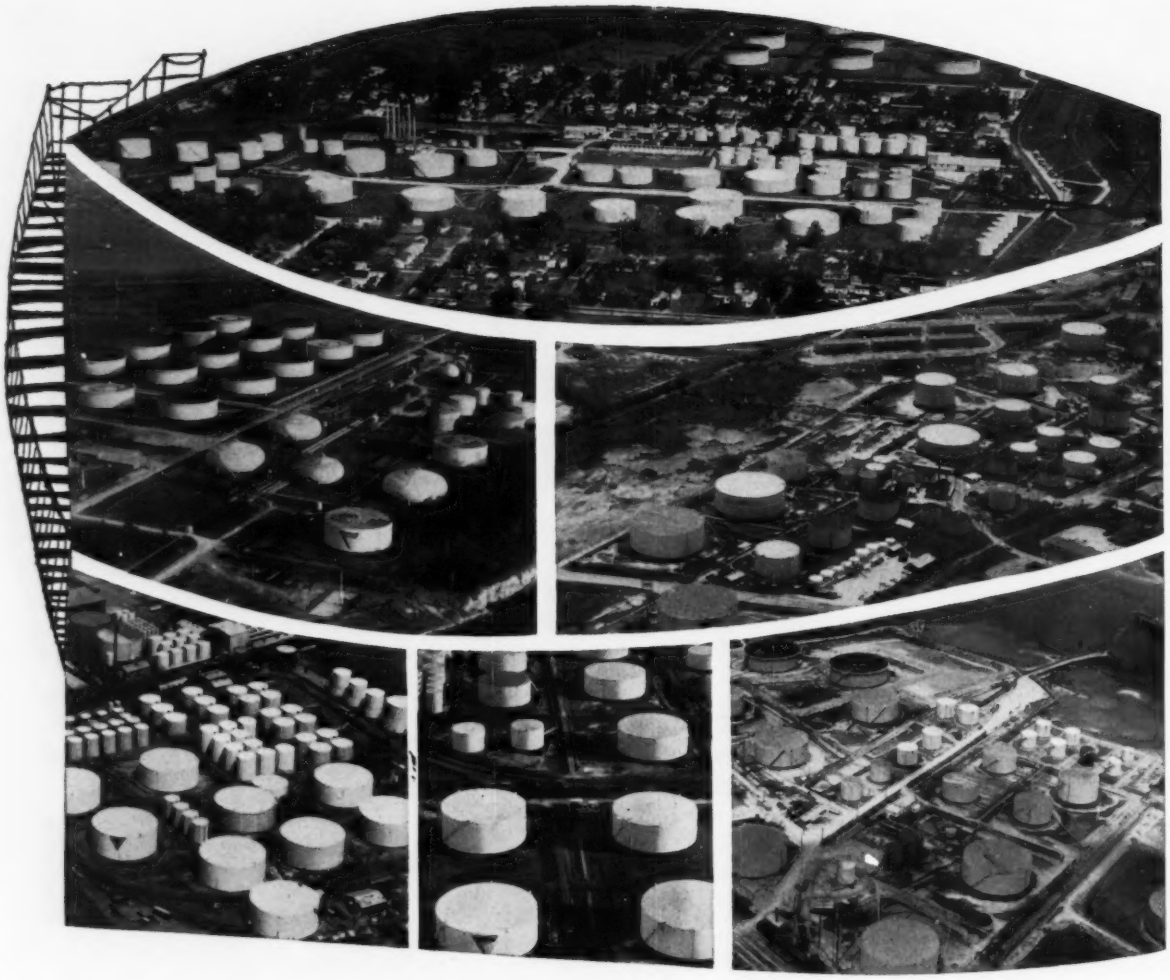

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2. Epoxidation

$$HOCH_2CH{=}CHCH_2OH \longrightarrow HOCH_2CHCHCH_2OH \quad (O \text{ bridge})$$

3. Butadiene Dioxide

$$HOCH_2CH{=}CHCH_2OH \xrightarrow{Br_2} HOCH_2CHBrCHBrCH_2OH \xrightarrow{\text{alkali}} CH_2CHCHCH_2 \quad (O, O)$$

4. Ester formation

$$HOCH_2CH{=}CHCH_2OH + (CH_3CO)_2O \longrightarrow CH_3COOCH_2CH{=}CHCH_2OOCCH_3$$

5. Ether formation

$$HOCH_2CH{=}CHCH_2OH + 2 \text{ (}CH{=}CH_2\text{)} \longrightarrow \text{(}CH(CH_3)OCH_2CH{=}CHCH_2OCH(CH_3)\text{)}$$

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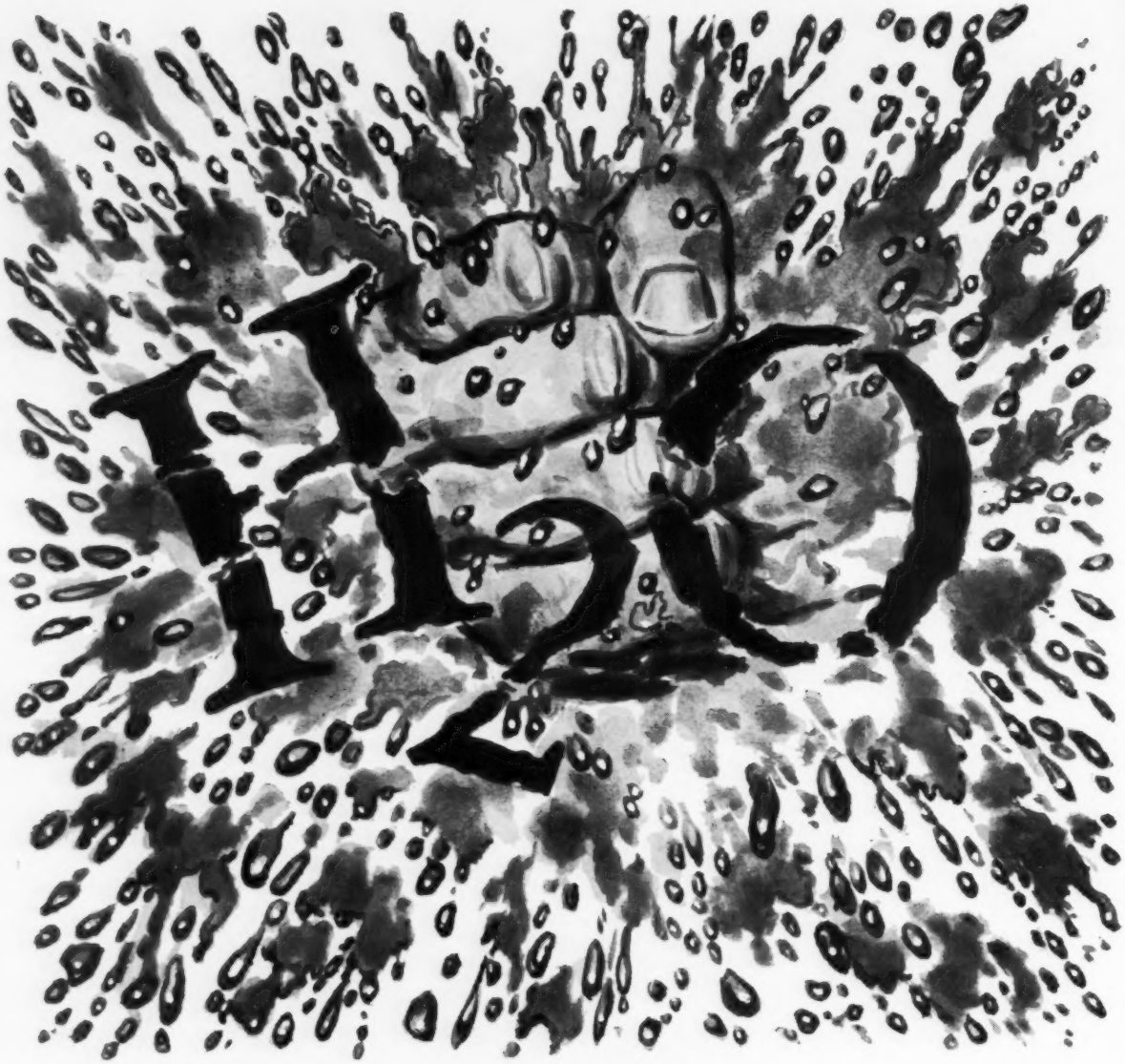

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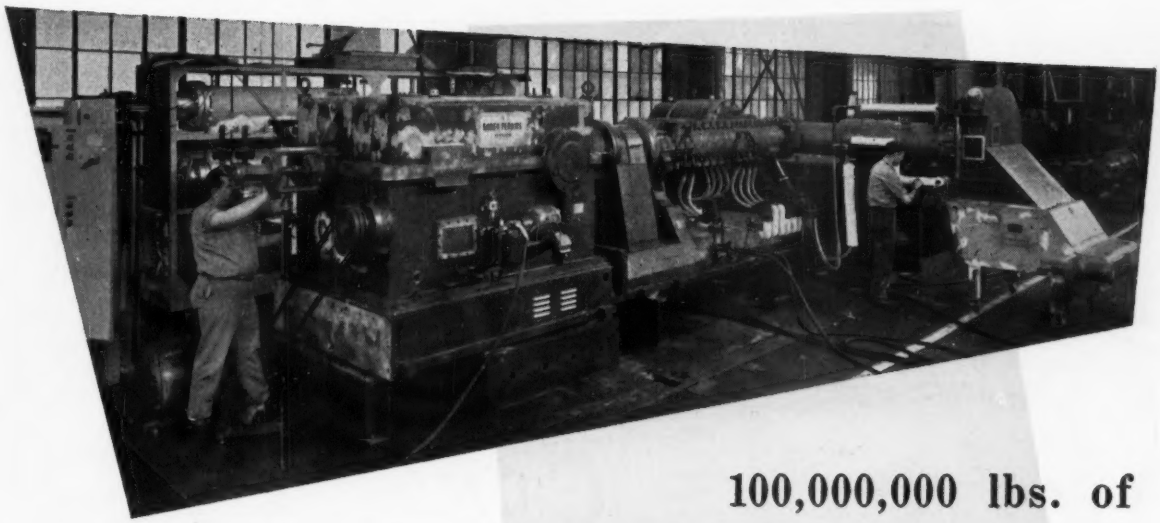


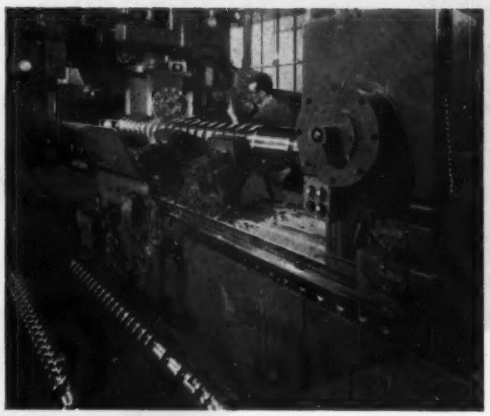
100,000,000 lbs. of POLYOLEFINS PER YEAR WILL BE PRODUCED BY 10 CONTINUOUS PROCESSING LINES NOW BEING BUILT BY BAKER PERKINS

Now all the well known advantages of continuous processing have been adapted by Baker Perkins to compounding polyolefins and other plastics. The operation of each B-P processing line is fully continuous from the feeding of the polymers, pigments, stabilizers and other additives to the discharge of the dried pellets ready for bagging. Each line includes a Force Feeder, *a Ko-Kneader (List System) Continuous Mixer, *a Cross-Head Extruder, *a Hot-Cutting Unit, Water Cooling Trough, Dewatering Conveyor and *Heating and Cooling Unit for the Ko-Kneader and Extruder. Individual lines are designed for 750, 1800, or 3500 pounds per hour.

*These units are shown in top photograph.

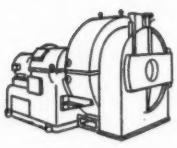
ADVANTAGES OF B-P CONTINUOUS PLASTICS PROCESSING SYSTEM

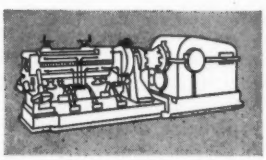
- Improved Product Quality
- Maximum Operating Flexibility—
  Coloring, compounding, venting, modifying, blending and homogenizing can all be accomplished in the same machinery without any alteration.
- Lower Installed Cost—
  Single floor installation
  Uniform power loads minimize electrical wiring requirements.
- Reduced Operating Costs
- Low Maintenance Costs

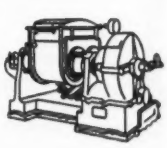


Modern equipment and skilled operators produce the precision components of Baker Perkins plastics processing lines. The operator in the photo above is machining a Ko-Kneader screw on one of the many special purpose machine tools in Baker Perkins shops. Extruder screws are also machined on this same machine. Exacting quality control is maintained in all manufacturing operations at Baker Perkins.

BAKER PERKINS INC.

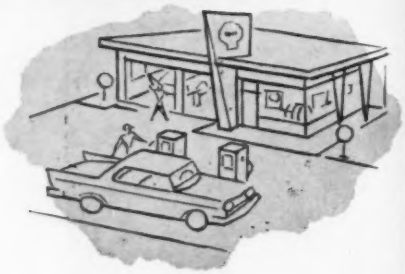






CONTINUOUS CENTRIFUGALS • CONTINUOUS MIXERS • UNIVERSAL MIXERS

SAGINAW, MICHIGAN 407



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The "Haul Mark"

Universal Aluminum

Always a leader in standardization, Standard Steel Works is now offering a custom quality aluminum transport employing quantity produced standard components that provide true universal adaptability.

Reversible, interchangeable hose tubes, fenders that fit either side, front or rear and movable king-pin, landing gear and tandem, reduce maintenance and increase profits with maximum usability of equipment. Even the rear lighting group can be removed in minutes for repair or replacement. Internal heads, internal rings or external rings at your option.

The manufacturing economy of producing in quantity is passed on to you. Let us quote you now on one of these beautiful transports to meet your requirements.

Built to the Highest Standard

Standard Steel Works, Inc.

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- ENGLEWOOD, NEW JERSEY
- SPARTANBURG, SOUTH CAROLINA

Now...two new low-cost intermediates

Typical Reactants

acrylates
alcohols
aldehydes
alkyls
amines
ammonia
carboxyls
dienes
halogens
hydrogen
isobutylene
mercaptans
olefins
organometallics
peroxides
styrene
sulfur
thiols
urea
vinyls

DIOCTYL FUMARATE

$$CH_3(CH_2)_3(CH_2CH_3)CHCH_2OOCCH \parallel HCCOOCH_2CH(CH_2CH_3)(CH_2)_3CH_3$$

or

DIOCTYL MALEATE

$$HCCOOCH_2CH(CH_2CH_3)(CH_2)_3CH_3 \parallel HCCOOCH_2CH(CH_2CH_3)(CH_2)_3CH_3$$

join Monsanto's "work-horse" monomers

DIBUTYL FUMARATE

$$CH_3(CH_2)_3OOCCH \parallel HCCOO(CH_2)_3CH_3$$

or

DIBUTYL MALEATE

$$HCCOO(CH_2)_3CH_3 \parallel HCCOO(CH_2)_3CH_3$$

Typical Products

acid esters
adhesives
clear coatings
copolymer emulsions
detergents
elastomers
fabric-sizing agents
fibers & free films
fumaramide
hydrocarbon stabilizers
ion-exchange resins
linear homopolymers
molding resins
paper impregnants
polymeric plasticizers
pour-point depressants
succinates
surfactants
synthetic lubricants
viscosity-index improvers

Versatile Intermediates for Creative Synthesis. These four stable monomers—clear, mobile liquids—react readily to give hundreds of valuable derivatives. For example, they produce substituted succinates by simple addition of thiols, halogens, aldehydes, and similar compounds. And they enter into the Diels-Alder reaction with conjugated dienes.

New "long-chain" DOF and DOM will be in full-scale commercial production soon. They promise significant economic advantages and, like highly reactive DBF and DBM, they copolymerize rapidly with styrene, vinyl acetate, vinyl chloride, acrylonitrile, and similar unsaturated monomers. By adjusting reaction conditions, you can easily tailor properties in compounds ranging from hard, brittle resins to soft, elastomeric materials. And the *internal plasticizing action* of these stable monomers gives permanent flexibility . . . makes "problem" polymers easy-to-use for adhesives, textile finishes, extrusions, molded products, coatings, lubricants and dry "instant" emulsion products.

FOR FURTHER INFORMATION, we offer a 20-page technical booklet on the dibutyl monomers that lists physical properties, describes in detail 34 broad categories of end products, and outlines 36 different kinds of reactions. A development bulletin on new DOF and DOM will be included. And we welcome your inquiries about any other fumaric or maleic esters. To get this literature promptly, mail the coupon *today*.

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
Department 2736 Y
St. Louis 66, Missouri

Monsanto

Please send me:

- ☐ Technical Bulletin RE-7
- ☐ Sample of DOF
- ☐ Sample of DOM
- ☐ Sample of DBF
- ☐ Sample of DBM

I am also interested in_____ fumarate and maleate.

*Name*_____ *Title*_____

*Company*_____

*Street*_____

*City*_____ *Zone*____ *State*_____

THREE WAYS EXTENSIBLE CLUPAK® PAPER SAVES MONEY FOR CHEMICAL PROCESSORS

New kind of paper stretches to reduce multiwall costs...improve performance

CLUPAK extensible paper multiwalls g-i-v-e to absorb impact and strain . . . give even better performance than conventional kraft bags of heavier basis weight . . . produce substantial paper tonnage savings, plus other major benefits:

FILLING: Multiwalls fill faster and more evenly . . . reduce breakage . . . prevent costly interruptions in filling line schedules.

HANDLING: Withstand boxcar manhandling by absorbing impact . . . minimize loss from product damage and waste.

WAREHOUSING: Take rougher handling, higher stacking, without splitting or bursting.

Today 15% to 25% of all industrial multiwalls are made of CLUPAK extensible paper. Savings are the reason! Ask the man who sells you paper for a test shipment!

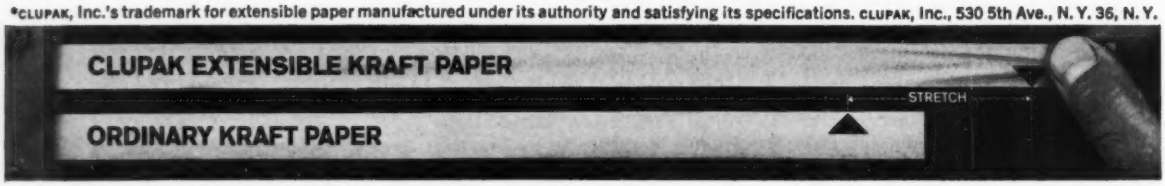
EXTENSIBLE CLUPAK PAPER **Compared to conventional kraft of equal basis weight has:**

- Up to 7 times more controlled machine direction stretch.
- 3 to 5 times greater ability to withstand impact and shock.
- 10 to 20% increase in cross direction stretch.
- 40% improved puncture resistance.
- Identical surface properties and printability.

EXTENSIBLE CLUPAK® PAPER*

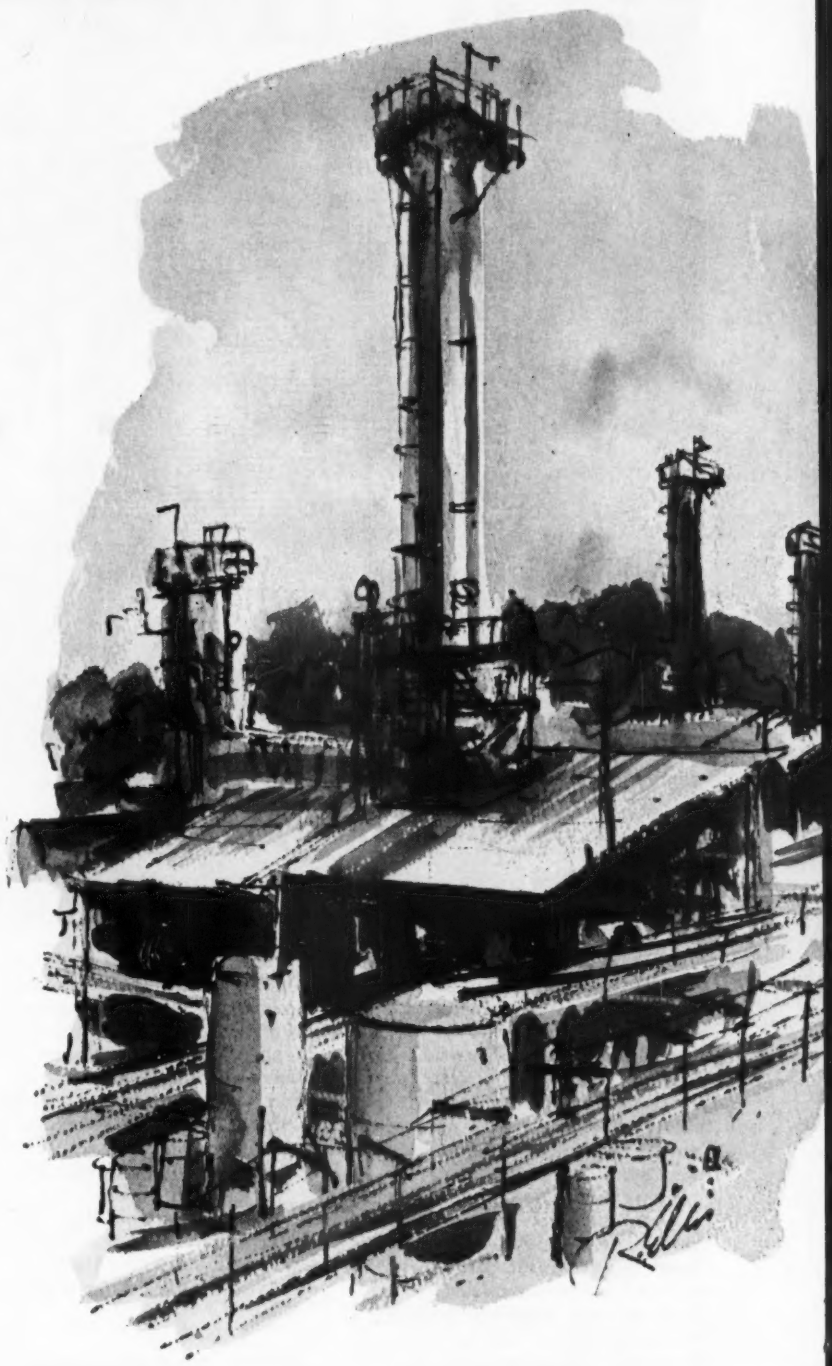
"IT STRETCHES TO SHRINK YOUR COSTS"

*CLUPAK, Inc.'s trademark for extensible paper manufactured under its authority and satisfying its specifications. CLUPAK, Inc., 530 5th Ave., N. Y. 36, N. Y.



INTERMEDIATES

Acetaldehyde Ammonia
Acetophenone
Acetyl Chloride
Adipoyl Chloride
Anisic Aldehyde
Anisyl Acetone
Anisyl Alcohol Tech.
Anisyl Cyanide
Azelaoyl Chloride
Benzalacetophenone
Benzhydrol
Benzhydrylamine
Benzhydryl Chloride
Benzophenone Tech.
Benzyl Alcohol Tech.
Benzyl Cyanide
Butyroyl Chloride
n-Caproic Acid
Caproyl Chloride
Capryloyl Chloride
p-Chlorbenzhydrol
p-Chlorbenzhydryl Chloride
p-Chlorbenzophenone
p-Chlorbenzyl Cyanide
Cinnamoyl Chloride
Decanoyl Chloride
Dibenzyl Ether
Dicyclohexyl Carbinol
Dicyclohexyl Ketone
p,p′-Dimethoxybenzophenone
Diphenyl Acetone (unsym)
Diphenyl Methane
Ethyl Formate Tech.
Ethyl Phenylacetate
beta Ionone
Isobutyroyl Chloride
Isovaleric Acid
Isovaleroyl Chloride
Lauroyl Chloride
p-Methoxy Phenylacetic Acid
Methyl Heptenone
Methyl Phenylacetate
Myristoyl Chloride
Oleoyl Chloride
Palmitoyl Chloride
Pelargonyl Chloride
Phenylacetic Acid
Phenylacetone
Phenylacetyl Chloride
Phenyl Propyl Alcohol (1,3)
Phenyl Propyl Chloride (1,3)
Potassium Phenylacetate
Propionyl Chloride
Propiophenone
Sebacoyl Chloride
Sodium Phenylacetate
Stearoyl Chloride
And
Other Intermediates



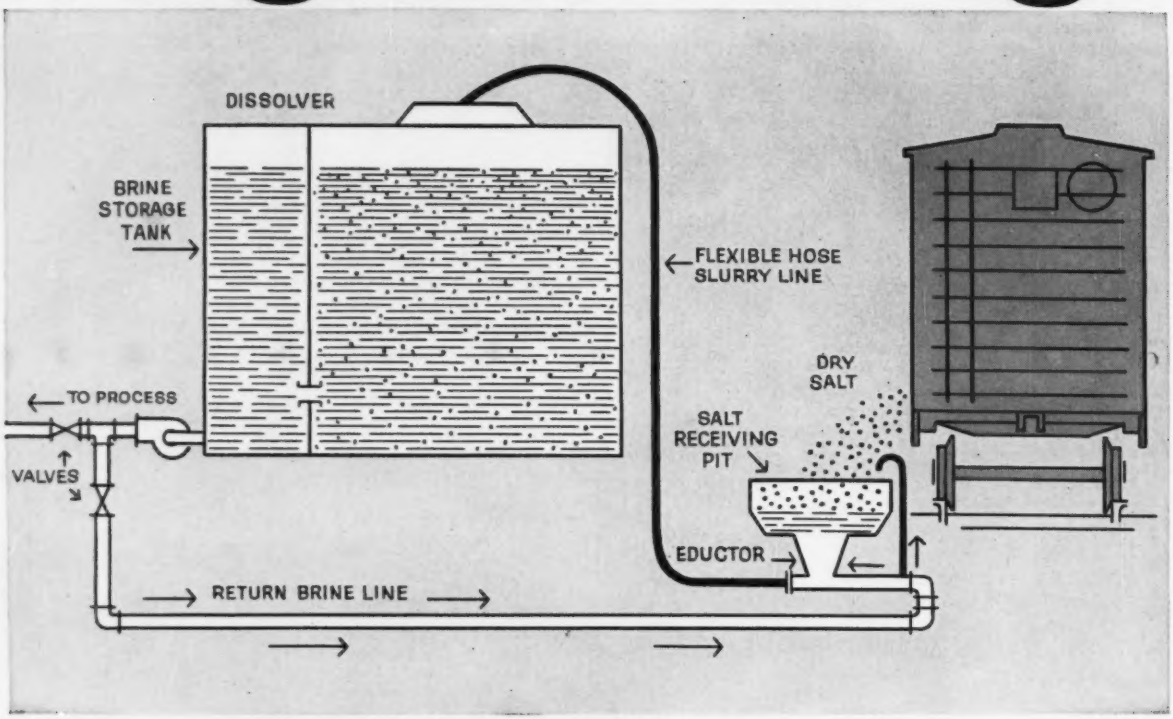
1952

THE TRUBEK LABORATORIES, INC.

A SUBSIDIARY OF UNIVERSAL OIL PRODUCTS COMPANY

East Rutherford, New Jersey

salt engineering



New hydraulic salt-handling system pays for itself in one year

A food-specialties manufacturer used to buy evaporated salt in bags. They used a batch mixing process to combine the salt with other ingredients to produce a patented product. Lugging the salt from boxcar to the plant, storing it, then dumping into mixing vats was time-consuming, expensive and took up valuable warehouse space.

In an effort to speed up and economize on the operation, this manufacturer called in an International Salt Company Technical Service Representative. He recommended simplifying the mixing process by installing a Storage Brinomat* Dissolver outside the plant. The Dissolver automatically supplies sparkling, pure brine to the process *continuously*.

He also recommended buying less expensive bulk salt by the carload and delivering it to the Dissolver by a hydraulic handling system. In this system, designed by International's Technical Service Department (see diagram above), a power scoop pushes salt from the cars into a receiving hopper feeding an eductor system. There the salt is mixed with brine from the Dissolver and educted as a slurry of saturated brine and undissolved salt to the Dissolver.

Efficiency and economy have been remarkable. After one year of operation the plant manager informed International that the entire system had already paid for itself!

Hydraulic handling systems can be designed to unload, move and store any amount and type of salt—rock or evaporated.

With over fifty years' experience, International is uniquely equipped to offer assistance on all phases of salt or brine usage. Even if you're satisfied with your present operation, perhaps it *could* be improved. Why not review your operation with an International Technical Service Representative? Salt is his business. Write International Salt Company, Clarks Summit, Pa., or call our nearest district office.

*Registered T.M. International Salt Company

BOSTON CHARLOTTE CINCINNATI NEWARK NEW YORK PITTSBURGH
BUFFALO CHICAGO DETROIT NEW ORLEANS PHILADELPHIA ST. LOUIS

INTERNATIONAL STERLING SALT SALT COMPANY

"A STEP AHEAD IN SALT TECHNOLOGY"

CYANAMID

For the first time, the cyanamide radical is available as a stable, colorless, concentrated 50% aqueous solution of **hydrogen** cyanamide. And it sells for only 10¢ a pound!

This new form of an old and useful compound contains a minimum of metallic and nitrogenous contaminants. For full details, send for your free copy of our data sheet on Hydrogen Cyanamide and/or the comprehensive technical manual, "Cyanamide by Cyanamid," and a sample.

SOME PRODUCTS OF CYANAMID'S PROCESS CHEMICALS DEPARTMENT:
ACCOBOND® Resins • AEROCARB®, AEROCASE®, AEROHEAT® Metal Treating Compounds • AEROSOL® Surface Active Agents CYQUEST* Sequestering Agents • HYFORM® Emulsions • Ammonium Sulfate Ferrous Sulfate (Copperas) • Lime and Limestone • Mineral Acids • Aluminum Sulfate

Products Marketed Under the AERO® Trademark are:
Ammonium Nitrate • Calcium Carbide • Calcium and Hydrogen Cyanamides Cyanuric Chloride • Dialkyl Maleates • Dicyandiamide • Glycolonitrile • HCN (liquid Hydrocyanic Acid) • Maleic Anhydride • Metallic Stearates Phthalic Anhydride • Ferrocyanides • Urea, Crystals and Uncoated Prills
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AMERICAN CYANAMID COMPANY
PROCESS CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, New York 20, N. Y.

American Cyanamid Company CWP-107
Process Chemicals Department
30 Rockefeller Plaza, N. Y. 20, N. Y.

Please send me:
☐ "HYDROGEN CYANAMIDE" Data Sheet
☐ "CYANAMIDE BY CYANAMID" Technical Manual
☐ A sample of Hydrogen Cyanamide

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

Progress with FATTY ACIDS

SANDPAPER LASTS LONGER

A metallic salt of Stearic Acid is being used to increase the life of sandpaper for woodfinishing. Treating the sandpaper with zinc stearate apparently prevents the fine wood particles from building up and prematurely clogging the abrasive surface.

WELL-GROOMED AND OLEIC ACID HELPED

His detergent soap . . . liquid shampoo . . . and hair dressing depend in part on derivatives of Oleic Acid for their effectiveness. Amine soaps of this fatty acid provide good detergent action, act as non-ionic emulsifiers and emollients in many cosmetic formulations.

MORE COLORING FUN

Stearic Acid keeps crayons from going limp in little fingers. It imparts hardness and non-melting characteristics, also serves as a pigment binder. Shades stay true, whites won't yellow.

Below are facts you should know about two Fatty Acids produced by A. Gross. Why not write us for samples and additional information on these and other Fatty Acids we produce. Send for the latest edition of the brochure "Fatty Acids in Modern Industry". Address Dept. CW-5.

Specification	GROCO 57 HYDROGENATED TALLOW F.A.	GROCO 2 1°—3°C. TITRE OLEIC ACID
Titre	57°—59°C.	3°C. max.
Titre	134.5°—138°F.	37.4°F. max.
Color 5¼" Lovibond Red*	2.0 max.	1 max.
Color 5¼" Lovibond Yellow*	10 max.	10 max.
Unsaponifiable	0.75% max.	1.5% max.
Saponification Value	204—207	198—203
Acid Value	203—206	197—202
% F.F.A. as Oleic Acid		99 min.
Iodine Value (WIJS)	4—6	95 max.
Refractive Index 50°C. (Av.)		1.4505

* 1" cell for GROCO 2

a. gross & COMPANY

295 MADISON AVENUE • NEW YORK 17, N. Y.

Factory: Newark, New Jersey • Manufacturers Since 1837

HARDWORKING JEFFERSON CHEMICALS

GLYCOLS for POLYESTER RESINS

Propylene glycol gives both cost and property advantages in polyester resins

Propylene glycol is the lowest cost commercially available glycol for polyester resins. This, together with the outstanding resin properties it imparts, is the reason for its rapid growth as a component of these materials.

Polyesters prepared from propylene glycol have excellent strength properties and water resistance, are light-colored, stable, and dissolve easily in styrene. They provide fast wet-out for hand lay-up, contact-pressure mouldings. Outstanding physical properties are obtained on laminates prepared with matched metal dies at moderate pressures.

The use of propylene glycol as the basic glycol component of polyesters gives the resin producer considerable formulation latitude. For example, the addition of ethylene glycol increases strength and hardness while the incorporation of diethylene or dipropylene glycols results in a softer, more flexible polymer. By varying the type and quantity of other glycols added to propylene glycol, polyesters may be tailor-made for a particular end use. Whether your application is for boats or buttons, chances are the use of propylene glycol-based polyesters will lead to improved products and profits.

GLYCOL PRICE SCHEDULE

Propylene Glycol	12½ cents/pound
Dipropylene Glycol	14¼ cents/pound
Ethylene Glycol	13½ cents/pound
Diethylene Glycol	15¼ cents/pound

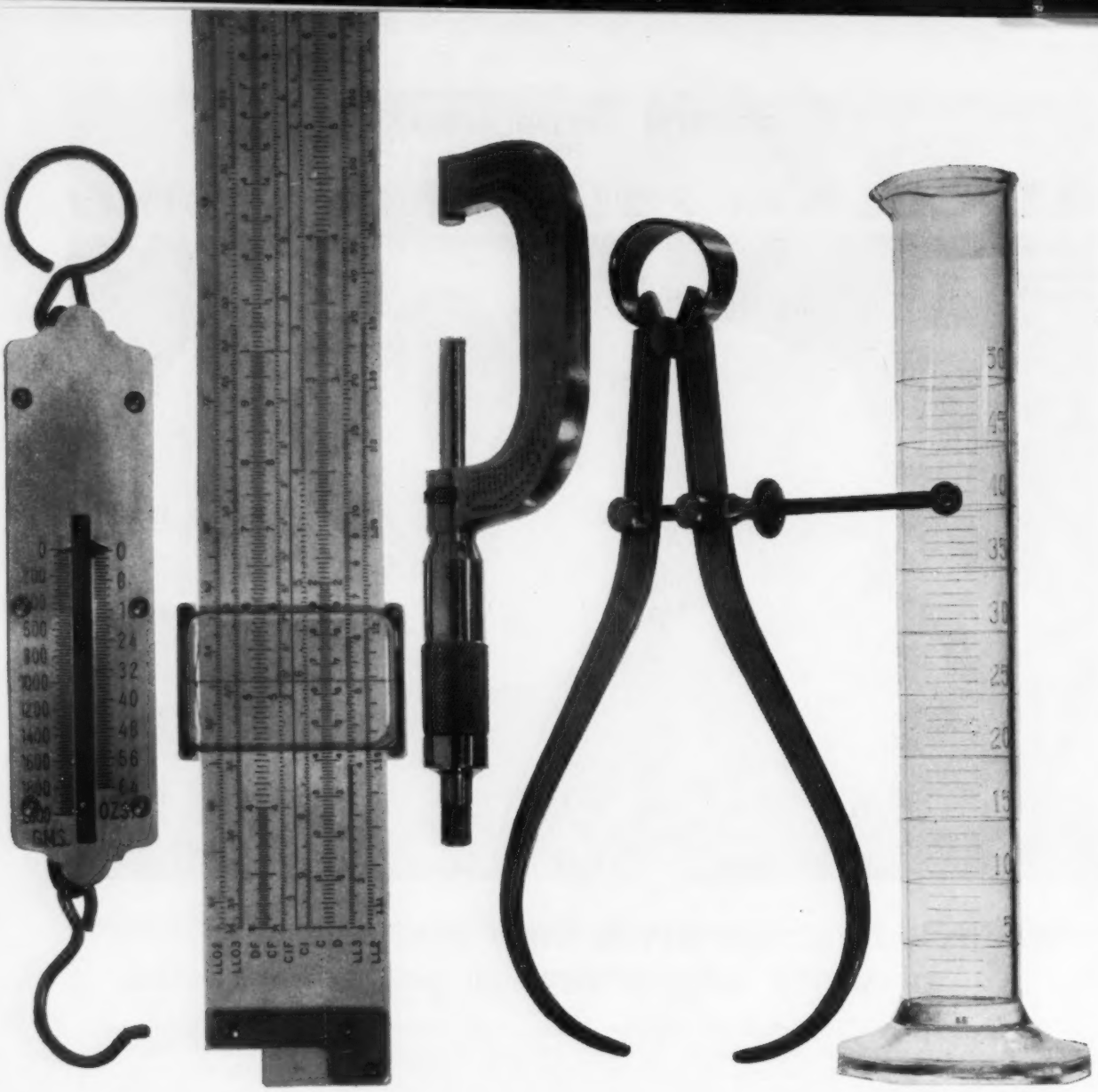
Current prices for tank car quantity (4,000 gal. min.) F.O.B. shipping point, freight allowed in the East. Subject to change without notice.

For complete information on Jefferson Propylene and Ethylene Glycols, please contact Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

HOUSTON • NEW YORK • CHICAGO • CLEVELAND
CHARLOTTE • LOS ANGELES • SAN FRANCISCO

JEFFERSON CHEMICALS

037



How do you measure experience?

Only one way—years in the business. And only Allied Chemical has 70 years' experience with ammonia—70 years in which we've probably solved any problem you run into . . . experience which grows with every service call and is always on call. Here are some factors you can measure directly: NUMBER AND LOCATION OF PLANTS — Compare Allied Chemical's five industry-located plants. ● AVAILABLE FORMS — Compare Allied Chemical's three forms—anhydrous and aqua ammonia and ammonium nitrate solutions. ● SHIPPING CONTAINERS — Compare Allied Chemical's ability to ship in any container you need—barges, tank cars, transport trucks, tank trucks, cylinders. ● DELIVERY SPEED — Compare Allied Chemical's expedited shipments from bulk terminals in addition to its five plants. ● Evaluate all ammonia producers, then choose the one that measures up best on all counts . . .

Allied Chemical has more experience with ammonia than any other producer

BASIC TO AMERICA'S PROGRESS

Allied Chemical

NITROGEN DIVISION

Dept. AC 3-7-3, 40 Rector St., New York 6, N. Y.

Business
Newsletter

CHEMICAL WEEK
October 7, 1961

More propylene for the East. High-purity propylene capacity at Sun Oil's Marcus Hook, Pa., refinery will be boosted 150%—to 300 million lbs./year—when new facilities go into operation during second-quarter '62. Construction of the additional units, says Sun Vice-President W. T. Askew, will begin early next month, cost about $2.2 million. It will, he adds, make Sun the "largest commercial producer of propylene in the U.S."

Full design capacity (180 million lbs./year) of the expansion will be reached with completion of a $14-million catalytic cracking unit at Marcus Hook in Oct. '62. A $9.3-million gas processing plant, scheduled for completion this November, will provide charging stock to the propylene units.

Sun officials are reluctant to discuss contracted outlets for the additional propylene at this time, but chances are that much of it is spoken for. One likely customer: Shell Chemical's 80-million-lbs./year polypropylene plant now being built near Woodbury, N. J. This could take well over 100 million lbs./year of Sun's 99.4%-pure product. Shell has "no comment" on contractual arrangements for the polypropylene plant.

AviSun, with its newly dedicated polypropylene plant at New Castle, Del. (*CW Market Newsletter, Sept. 30*), is probably also certain to account for heavy quantities of Sun's propylene.

•

Two other new polypropylene developments this week:

U.S. marketing rights to Montecatini's shrinkable polypropylene film have been assigned to Versapak Film & Packaging Machinery. Agreement was signed with Chemore, Montecatini's U.S. arm.

Allied Chemical's Plastic Division starts polypropylene marketing Nov. 1. No details are available, but division President Frank Norton says marketing demands would be supplied through a "working arrangement" with a present manufacturer producing materials to Allied's specifications. The product to be sold by Allied will be tagged Plaskon polypropylene.

•

A $6-million hydrogen fluoride and fluorocarbon plant is in the works for Louisiana. Kaiser Aluminum & Chemical will begin "immediate" construction of the new facilities adjacent to its aluminum and caustic-chlorine plants at Gramercy, La. The fluoride unit will be integrated with an earlier-revealed aluminum fluoride plant, and operations are scheduled for late '62. The company plans to set up distribution and technical services to market the products.

Sums up President D. A. Rhoades: "In view of our established program of producing an increasing percentage of our own raw materials,

and our own substantial annual requirements for hydrogen fluorides used in the aluminum reduction process, this expansion is a logical development for us."

•

Another potash producer in New Mexico. Kermac Potash Co.—organized as a 50-50 subsidiary by Kerr-McGee Oil Industries (Oklahoma City) and National Farmers Union Service Corp. (Denver)—is planning a 1,500-tons/day potash plant to tap the "extensive" reserves formerly held by Farm Chemical Resources Development Corp. in Lea County, northeast of Carlsbad, N.M. (*CW, Feb. 4, p. 23*). Construction will begin after a pilot-plant program at Kerr-McGee's Metallurgical Research Laboratory at Golden, Colo., to determine design and engineering details. Phillips Petroleum—formerly a part owner of FCRDC, along with Kerr-McGee and National Farmers—sold out to these former partners last spring.

•

Japan is moving fast to double exports in five years. The government plans to improve Bank of Japan export financing, boost tax deductions on export earnings (from 80% to 100%), set up a new depreciation and depletion allowance system for export industries. Additional moves: export insurance rates will be cut, and a reserve fund to develop markets will be established.

Meanwhile, the Japanese government has cleared a batch of deferred-payment export deals, including a $7-million pulp plant for Indonesia and a $2.7-million polyvinyl chloride plant for the Philippines.

•

Egypt has signed a contract with West Germany's ZAFN and Ferrostaal companies to build a 3,200-tons/year organic chemicals plant at Hawamdia. It will be the biggest plant of its kind in the Middle East.

•

And another corn-belt nitrogen plant. Central Farmers Fertilizer and three other farm co-ops are planning a $20-million plant in Illinois or Indiana (possibly on the Ohio River) to produce about 350 tons/day of ammonia and derivatives. Three other nitrogen fertilizer projects are under way in southeast Iowa (*CW, Sept. 23, p. 26*).

•

Newsnotes from abroad: When Spanish government approval comes through, Du Pont and Energia Industrias Aragonesas (Madrid) will form a 50-50 joint subsidiary (Desarrollo Quimica Industrial S.A.) to produce Du Pont's maneb and zineb dithiocarbamate. A plant will be built adjoining Aragonesas' Sabinanigo operations. . . . Caltex has decided to include a 6,450-bbls./day Isocracker in the refinery it is now building at Frankfurt/Main, West Germany . . . Montecatini will get an interest in Delta Chemie, Netherlands fertilizer producer, while Delta will participate in the Italian firm's majority-owned Dutch subsidiary, Compagnie Neerlandaise de l'Azote. The latter produce nitrogen fertilizers.

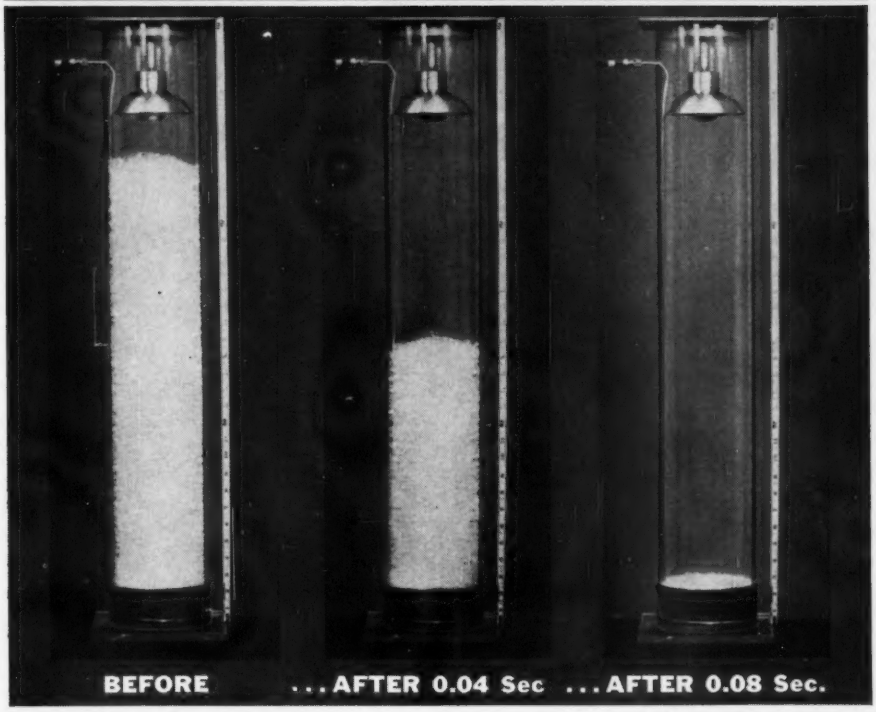
TEKNIKA

MODERN

DEFOAMING

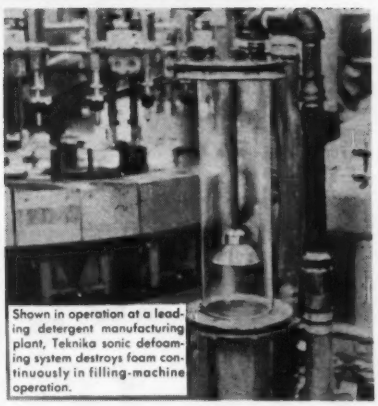
SYSTEMS

USING SONIC ENERGY



REVOLUTIONARY! SONIC ENERGY DESTROYS FOAM INSTANTLY!—at lowest cost—no moving parts—eliminates chemicals

- **In Use Now** in these industries:
  Chemicals • Soaps, shampoos, detergents • Pharmaceuticals • Foods • Paper • Liquors • Petroleum • Photographic Liquids • Plastics • and many others
- **Installed in:** Filling machines • Fermenters • Distillation kettles • Reactors • Vacuum systems • Oxidizers
- **Operated by:** Compressed Air • Steam • Nitrogen • Carbon Dioxide and other gases (no electronics)



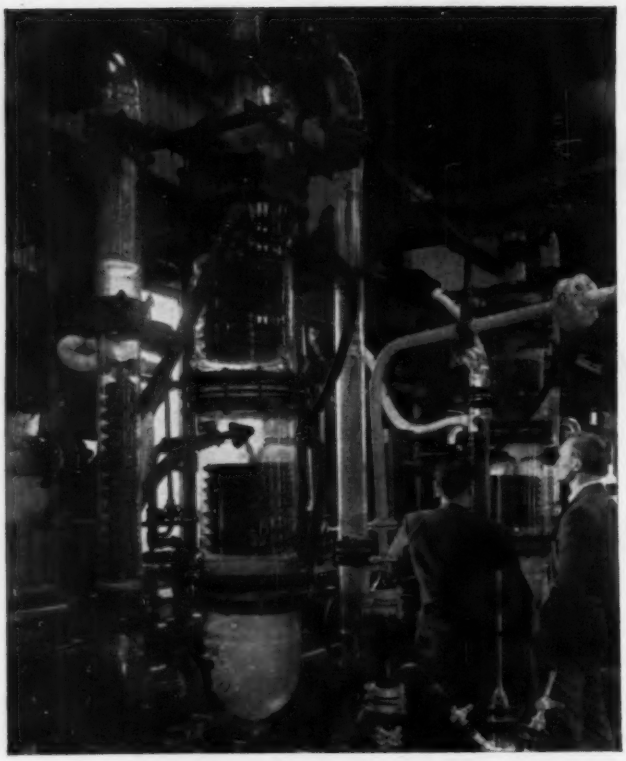
Shown in operation at a leading detergent manufacturing plant, Teknika sonic defoaming system destroys foam continuously in filling-machine operation.

Visit Teknika Booth 1098 at CHEMICAL INDUSTRIES EXPOSITION, New York Coliseum, NOV. 27 to DEC. 3

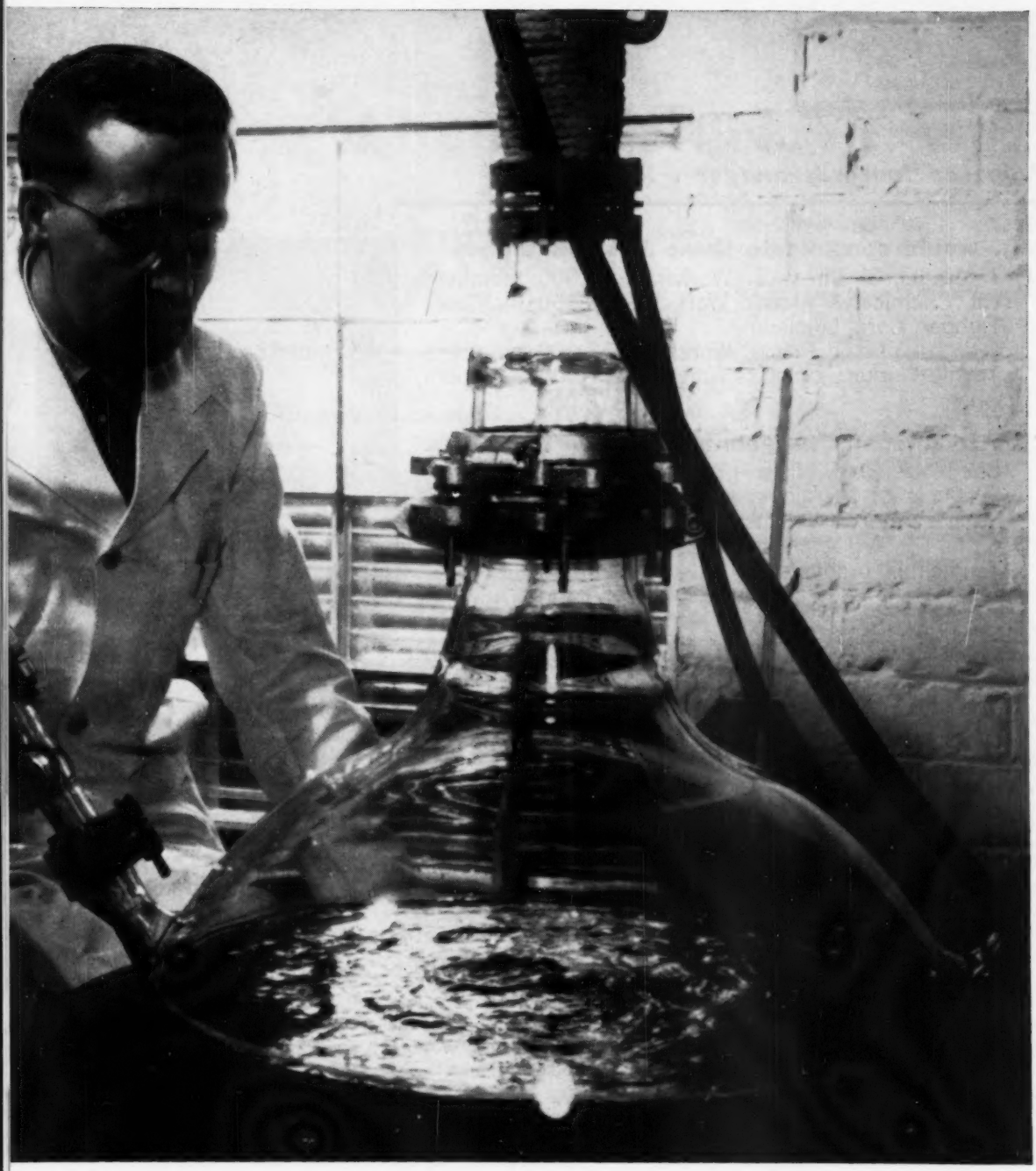
WRITE OR CALL NOW for the Teknika solution to your foam problem:

TEKNIKA/INC.

634 Asylum Ave., Hartford 5, Conn.
Phone: CHapel 7-3285



Now you can have complete unit processing in glass



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Proposed four-way merger . . .

. . . would consolidate these AFL-CIO unions

International Chemical Workers	81,000	members
Oil, Chemical & Atomic Workers	180,000	members
Rubber, Cork, Linoleum and Plastic Workers	158,000	members
Textile Workers Union of America	197,000	members
	616,000	

. . . to intensify bargaining in these industries

Chemicals and allied products	536,400	workers*
Products of petroleum and coal	142,200	
Rubber and miscellaneous plastics products	188,400	
Textile-mill products	823,900	
	1,690,900	

*Hourly paid employees.

WIDE WORLD

Reuther calls for coordination.

Launching Scheme for Labor Unity

The time may be at hand for a consolidation of union activities in the chemical process industries. That's how CPI labor leaders are talking. Behind the talk is growing concern over increasing horizontal diversification by CPI companies.

Case in point: a minority interest in Blume Knitwear (New York), maker of sweaters and other apparel, was acquired by Chemstrand Corp.

Chemstrand is wholly owned by Monsanto Chemical, a big producer of chemicals, petrochemicals and plastics; its Lion Oil Division is an integrated producer, refiner and marketer of oil, natural gas and gasoline. Largest single owner of Monsanto stock (about 13%) is American Viscose, a principal producer of rayon, acetate and cellophane. Avisco and Sun Oil jointly own AviSun, producer of polypropylene resin, fiber and film. Sun Oil also will be supplying propylene to Shell Chemical (chemicals, plastics, and synthetic rubbers).

Labor leaders say that it's no longer logical or practical to have one union that's confined to chemical plants, one for oil refineries, a third for rubber factories, and a fourth for textile mills.

According to these unionists—of whom President Walter Mitchell of the International Chemical Workers appears to be the most ardent advocate—the time has come to plan a merger of the four principal AFL-CIO unions in these jurisdictions (*table, above*).

Mitchell maintains that such a merger is "inevitable" because of the extent to which the companies in these industries have been crossing over into each other's product lines. And his reasoning has impressed a potentially influential backer: Walter Reuther, president of the United Auto Workers and also president of the AFL-CIO's Industrial Union Dept.—with which these chemical, oil, rubber and textile unions are affiliated.

Last spring, CHEMICAL WEEK learns, Mitchell told Reuther that industry cross-overs have confronted these unions with massive problems in organizing and bargaining. Reuther then invited Mitchell and the presidents of the other three unions concerned—O. A. Knight, Oil Workers; George Burdon, Rubber Workers; and William Pollock, Textile Workers—to a conference in Detroit.

At that meeting, the foursome discussed the desirability of cooperation and coordination in organizing. One scheme propounded: that new locals organized through joint efforts of the four unions and the IUD might be affiliated directly with IUD, rather than with any individual union. A four-union committee was appointed to work out details.

Although the other three presidents regarded the meeting as nothing more than a step to tidy up organizing procedures, Mitchell seems to have thought that the coordinated organizing plan was understood to be a step toward ultimate merger.

The four-way merger was advocated by Norman Krieger, president of a Union Carbide local at Buffalo, N.Y., at last month's OCAW convention. That convention adopted a resolution favoring merger "with unions of similar jurisdiction"; and the idea has been endorsed by ICWU's executive board. Increasing financial difficulties could push these unions toward merger as an economy measure; but as of last week, the outlook was that the proposed four-way merger would be a long time in coming.

Glycerin Makers Ponder: How Many's a Crowd?

Further oversupply problems loomed for the glycerin market this week when Olin Mathieson confirmed that its Organics Division will bring onstream next April a 40-million-lbs./-year plant. According to D. J. C. Copps, division vice-president and general manager, the multimillion-dollar unit—at Olin's Doe Run complex at Brandenburg, Ky.—will make glycerin from propylene oxide via the allyl alcohol route.

The first step will involve a lithium phosphate catalyst, which Olin says gives high yields of allyl alcohol. The latter steps could be adjusted to yield either glycerin or epichlorhydrin, but Olin officials say they will stick to glycerin exclusively. There had been speculation that at least some epichlorhydrin would be produced.

Captive Use Essential: Olin might have been in a good position to market epichlorhydrin to epoxy manufacturers, since it is not in the epoxy business itself. But the firm decided it needed captive outlets for the end-products, so glycerin got the nod. Olin uses about 10 million lbs./year of glycerin for cellophane production, 2 million lbs./year in making explosives, and close to 1 million lbs./-year in its Squibb Division's pharmaceutical production.

Several established producers have expressed surprise at Olin's decision to enter a glycerin market already faced with oversupply. Makers of synthetic and natural glycerin have been involved in price cutting (*CW Market Newsletter, Aug. 5*), and Atlas Chemical's projected entry with a 30-million-lbs./year plant near Wilmington, Del., added to the complications (*CW Business Newsletter, March 25*).

And, according to the Glycerin Producers' Assn., stocks remain at high levels despite production cutbacks. August figures show that at month's end, stocks were 67 million lbs.—up 15.5 million lbs. from 1960.

But Olin insists that negotiations are nearing completion on enough contracts to take up most of the production it will not use captively. No details have been released, but speculation in the trade suggests Reichhold as a possible major customer.

What About the Others: When both Atlas and Olin get going next year, the glycerin squeeze on the other producers is likely to become acute. Soapers can't cut back their glycerin production, unless they cut soap output. And Shell and Dow are producing "not nearly enough" to be profitable now, so further cutbacks there will be economically difficult.

Natural glycerin output has leveled off, after decreases forced by the inroads of detergents. Glycerin from soap still is dwindling, but this is being offset by increases in production of glycerin from fatty alcohols in detergent and shampoo manufacture, and from fatty acids.

According to GPA, glycerin demand has followed the nation's gross national product curve. There doesn't seem to be much chance of new uses for the product in the near future, so competition is bound to increase. Price cuts probably can't handle it all —although some pessimists have warned of crude dropping as low as 18¢/lb.—so possibly there will be more service offered along with supplies. Right now it is hard to move glycerin without getting into reciprocity agreements.

World Outlook: Overseas the situation is similar: overcapacity, with more production on the way. The two largest producers — Royal Dutch/-Shell with 44 million lbs./year in Holland, and Solvay et Cie. with 12 million lbs./year in France—are soon to be competing against plants in Japan and Egypt. Nippon Yushi Kogyko KK is building a 6-million-lbs./year unit in Japan and the United Arab Republic is adding a 2,400-metric tons/-year unit in Egypt.

The detergent industry overseas started later than it did in this country, so the foreign soapers will probably be cutting back for some time. But just how much this will help, nobody knows.

Overseas growth has boosted U.S. imports and cut exports. Through July of this year imports totaled 11.2 million lbs., compared with 6.5 million for the first seven months of last year. Exports over the same seven-month periods: 8.9 million lbs. in 1961; 13.4 million lbs. in '60.

Most likely results: glycerin from overseas will be switched away from U.S. markets, and the backup will force foreign prices down.

The Doe Run glycerin facilities actually have been under construction throughout this year (*CW, Jan. 21, p. 61*). Olin's organic chemicals plant at the same site, which uses hydrocarbons extracted from natural gas, will supply the raw materials. The method was developed at Olin's Research Center in New Haven, Conn. Olin says it has developed a new method of regenerating the catalyst. Constant use is said to strengthen rather than weaken it.

Before settling on the allyl alcohol route, Olin took a long look at the acrolein method. One factor that ruled it out: one of the by-products is acetone, which Olin does not market. And propylene oxide fits Olin's plans to explore propylene chemicals.

Olin's Copps: Will move into glycerin further upset market?

Chemical Production Pacemakers

Product	Unit	'48	'58	'59	'60
Titanium sponge	tons	10	4,585	3,898	5,311
Polyethylene	million lbs.	19	865	1,195	1,337
Argon	million cu. ft.	30	377	499	570
Synthetic fibers	million lbs.	75	594	793	856
Antibiotics	thousand lbs.	240	2,612	2,295	2,769
Helium	million cu. ft.	51	334	477	642
DDT	million lbs.	20	145	157	164
Styrene plastics, resins	million lbs.	165	763	977	1,062
Polyvinyl plastics, resins	million lbs.	218	869	1,166	1,190
Phosphoric acid	thousand tons	432	1,709	1,881	2,086
Xylenes	million gal.	61	200	241	282
Vitamins	thousand lbs.	2,566	9,763	10,845	11,063
All plastics, resins	million lbs.	1,485	4,659	6,021	6,140
Magnesium	thousand tons	10	30	31	40
Plasticizers	million lbs.	148	418	539	602
Ethylene glycol	thousand lbs.	367	1,145	1,215	1,299
Oxygen	billion cu. ft.	16	36	45	58
Anhydrous ammonia	thousand tons	1,375	3,879	4,520	4,812
Transparent films	million lbs.	205	627	682	706
Aluminum	thousand tons	623	1,566	1,954	2,014
Perchlorethylene	million lbs.	68	187	203	209
Pentaerythritol	million lbs.	21	52	64	64
Nitric acid	thousand tons	1,133	2,704	3,074	3,317
Synthetic rubbers	thousand l.t.	488	1,055	1,380	1,436
Butadiene	million gal.	661	1,465	1,816	1,883
Chlorine	thousand tons	1,640	3,605	4,287	4,587
Formaldehyde	million lbs.	617	1,358	1,750	1,698
Urea and melamine resins	million lbs.	149	349	424	399
Phenol	million lbs.	297	506	692	773
Benzene	million gal.	184	287	347	456

Lineup for Growth Derby

Products of the chemical process industries crowd the top brackets of a new list of products and services showing rapid growth rates during the past 13 years.

The study, a periodic project of the U.S. Dept. of Commerce, finds chemicals heavily represented among the frontrunners.

In fact nearly 43% of the items with steepest growth rates are CPI products (*table, above*). At the other end of the list, less than 3.3% of the products and services showing declining trends in the 1948-60 period are chemical products.

The new list—out last week—shows production, consumption or performance data for 70 products or services with rapid growth rates (average of 7½%/year or more); 142 items with moderate growth rates (average of less than 7½%/year); and 92 items with declining trends. It was compiled by Francis L. Hirt of the U.S. Commerce Dept.'s Office of Business Economics, is based on physical units rather than dollar-value.

Among the fastest-growing items, Hirt singles out polyethylene as an "outstanding example." Its output has expanded at an average annual rate of 40% since '48. Four other items —including titanium sponge— rank above polyethylene, but all four were relatively new in '48.

Hirt notes that '60 was the peak year for 66% of the rapid-growth items and for 42% of the moderate-growth items but that 85% of the items with declining trends had their peak years prior to '55.

Moving into MSG

To make fuller use of its biochemical facilities and to capitalize on a new fermentation process, Commercial Solvents Corp. last week decided to go into commercial production of monosodium glutamate, a food flavor "booster."

President Maynard C. Wheeler said two major units of CSC's plant at Terre Haute, Ind., are being converted and expanded for this operation and that by next June the company will be "a major U.S. producer."

Capacity was not stated, but comparison with a major fermentation-MSG project in Japan suggests a capacity of 3-4 million lbs./year. In '60, U.S. output rose 8.6%, to 21.64 million lbs.

Largest present producer in the U.S.: International Minerals & Chemical Corp., at San Jose, Calif. Next in line are Merck & Co., at Danville, Pa.; Great Western Sugar Co., at Johnstown, Colo.; and Hercules Powder, at Harbor Beach, Mich. A. E. Staley (Chicago) dropped out of the business last year.

CSC is the first U.S. company to commit itself to a microbiological process for large-volume production of MSG. Fermentation routes have been in use for several years in Japan, which has the largest production of MSG outside the U.S.; but in this country the most economic method has been by acid hydrolysis of Steffens waste from beet-sugar molasses (*CW, Aug. 24, '57, p. 37*). However, IMC acquired a small company early this year to test its own sugar fermentation process (*CW, March 18, p. 25*). Meanwhile, the largest Japanese producer has been pondering a shift to synthesis from acrylonitrile (*CW Technology Newsletter, April 16, '60*).

At Terre Haute, CSC will be using dextrose (probably from corn syrup, readily available from corn wet-milling plants in the area) and a bacterial organism (recently discovered in Japan) to which CSC has obtained exclusive rights. Wheeler said the process for volume production of free-flowing, high-purity MSG crystals was developed by CSC at its Terre Haute Research Center.

CSC plans to market the product to food processing and condiment companies. It will not market MSG in branded packages for retail sale.

Amax's Macgregor: Reducing the old reliance on dividends from Katanga.

Counting on Chemicals

By expanding its metals and chemicals operations in North America, American Metal Climax (Amax) will be cutting its reliance on African mining ventures for income. And corporate Vice-President Wallace Macgregor last week emphasized that Amax intends to get into production of tonnage chemicals—"industrial as well as agricultural."

The company's wholly owned Southwest Potash Corp. expects to be operating its new, $7-million potassium nitrate plant at Vicksburg, Miss., by January; and Macgregor says that both the potassium nitrate and coproduct chlorine will be "basic building blocks for our entry into tonnage chemicals."

SPC accounted for 8% of Amax's '60 earnings, this year will probably bring in 10%, Macgregor told San Francisco security analysts. The refinery at Carlsbad, N.M., he added, has more than 12% of the nation's potash capacity, and 50 million tons of proved reserves—a 15-year supply at the current mining rate.

About 60% of earnings are coming from the Climax Division, whose operating arms are Climax Molybdenum Co. and Climax Uranium Co. From its mine and plant at Climax, Colo., this division supplies 60% of non-Communist countries' molybdenum requirements, has 40 years' proved reserves.

This year, Amax is putting $19 million into capital spending; $10 million into mineral exploration and development; $2.2 million into research.

New Force for Unity

The Atlantic community's new economic grouping—the 20-nation Organization for Economic Cooperation and Development (OECD)—officially started business this week. If it lives up to its supporters' expectations, the new organization could help bring about greater economic harmony between the U.S., Canada and Western Europe. One effect might be to soften the impact on U.S. exports that is expected to follow development of the Common Market.

OECD replaces the outmoded Organization for European Economic Cooperation (OEEC), and differs from it radically. The U.S. and Canada are full-fledged members of the new organization, while in OEEC they had only observer status. While OEEC was concerned with Western European regional economic problems, OECD will tackle economic problems of the entire Western world. It will aim at promoting high economic growth, financial stability, expansion of world trade on a multilateral, nondiscriminatory basis. It will also strive to coordinate member nations' aid to underdeveloped countries.

Many of OEEC's information-gathering functions will be carried on by OECD. Many of the affiliates—e.g., the European Nuclear Energy and specialized committees dealing with specific industries, energy problems, transport, productivity, etc.—will be continued.

And a new office—Director of Scientific Affairs—is being established to serve committees dealing with research and scientific and technical education.

Like OEEC before it, the new agency will have advisory management and labor councils. OECD officials hope these councils will play a more active role than the ones that functioned under OEEC.

But these plans have run into hitches. The labor advisory group has been delayed in getting started, primarily because of AFL-CIO refusal to recognize Spanish trade unions as bona fide unions. (The Spanish didn't seek such recognition in OEEC.) And setting up the management advisory machinery has been held up while various U.S. management groups decide who will represent them.

M&T's Martin: Putting more emphasis on metal coatings and platings.

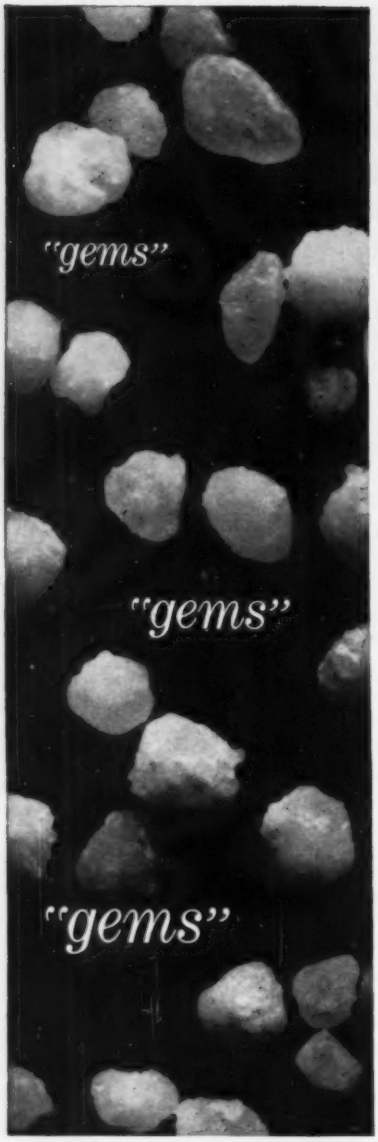
Doubling in One Blow

Metal & Thermit Corp. (New York) will double in sales volume—from last year's $40 million to a probable $80 million/year—if last week's proposal for a merger with Udylite Corp. (Detroit) is approved by stockholders. Such action could take place by year-end.

If the move goes through, M&T would be the surviving company. Its diversified operations — chemicals, minerals, metal plating, welding materials, coatings, and detinning—would be rounded out with Udylite's line of electroplating equipment and materials. While M&T has been building up its position in chemicals for chromium and zinc plating, Udylite has been moving ahead in processes for bright nickel plating.

Tentative plan calls for M&T to issue about 593,000 new shares of common stock in exchange for the 912,526 outstanding shares of Udylite common on a 0.65-to-1 basis—a $17.8 million transaction at today's market value of M&T stock (about $30/share). M&T's net worth Dec. 31, '60, was $19.5 million.

M&T Chairman H. E. Martin and Udylite Chairman L. K. Lindahl are having a detailed merger plan prepared for submission to all stockholders. Last spring a group of M&T stockholders controlling more than one-third of M&T's preferred shares blocked a move to change the corporate name (*CW, April 22, p. 23*). Now Martin believes the proposed merger can be ratified by a two-thirds majority of all stock.



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national roundup

Rounding out the week's domestic news.

Companies

Chemway Corp. (Wayne, N.J.) will sell to one of its subsidiaries a 235-acre tract in Wayne Township for development into a major industrial park. James M. Rice Associates (Maywood, N.J.) will be planning consultants.

American-Marietta Co. (Chicago), preparing for its proposed merger with Martin Co. of Baltimore (*CW Business Newsletter, Aug. 12*), has declared a special dividend of 17¢/share, payable Oct. 9 to stockholders of record on Sept. 29. Payment is about two-thirds the normal dividend due Nov. 1, and adjusts the American-Marietta dividend payment dates to those of the proposed Martin-Marietta company.

Samrak Chemical Corp. (New York) has been formed, taking over the Chemical Dept. of Frank Samuel & Co., a division of Howe Sound Co. (New York). The firm will continue to produce chemicals for industry and pharmaceutical manufacturing; staff and management will remain the same.

Chas. Pfizer & Co. (New York) has carried out the acquisition of Globe Laboratories (Fort Worth, Tex.), producer of animal vaccines and veterinary pharmaceuticals (*CW, Sept. 2, p. 29*). Pfizer issued 60,000 shares of its common stock (current market value: about $2.35 million) to acquire Globe's assets and business.

Expansion

Antiozonants: Universal Oil Products (Des Plaines, Ill.) will build a plant at McCook, Ill., to produce additives to prevent ozone attack on rubber products. The 1-million-lbs./year unit is due onstream late this year, Cost was not disclosed. Intermediates will be supplied by UOP's subsidiary, Trubek Labs (East Rutherford, N.J.), from a new unit due onstream next month (*CW, June 3, p. 24*).

Oxygen, Nitrogen, Argon: Air Reduction Pacific Co. (San Francisco) is doubling the output of its Richmond, Calif., air separation plant, boosting capacity to 200 tons/day of liquid oxygen, nitrogen and argon. Liquid nitrogen will be the primary product. Completion target: March '62.

Laminated Plastics: Spaulding Fibre Co. is starting work on a $2.5-million expansion of its Tonawanda, N.Y., laminated plastics plant, adding 30,000 sq.ft. of space to the 637,000-sq.ft. facilities. Completion is expected by early '63.

Pharmaceuticals: Schering Corp. Ltd. will build a $1-million pharmaceuticals plant, near Montreal. Completion: April '62.

Sulfur: Pan-American Petroleum (Tulsa, Okla.) is drilling an 11,500-ft. well to prove sour gas reserves near Riverton, Wyo. Favorable findings could lead to construction of an extraction plant that could supply Susquehanna Western Co.'s sulfuric acid plant in Riverton.

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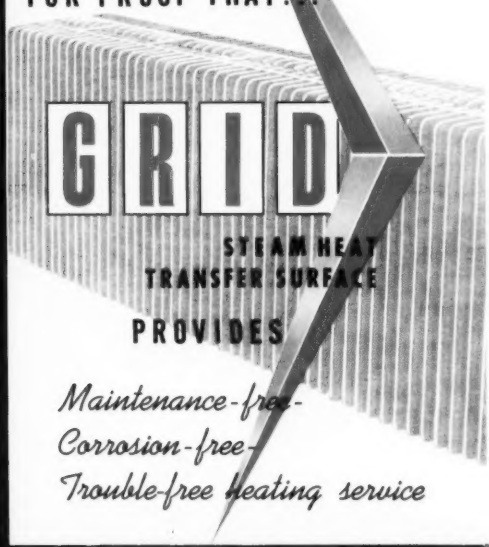

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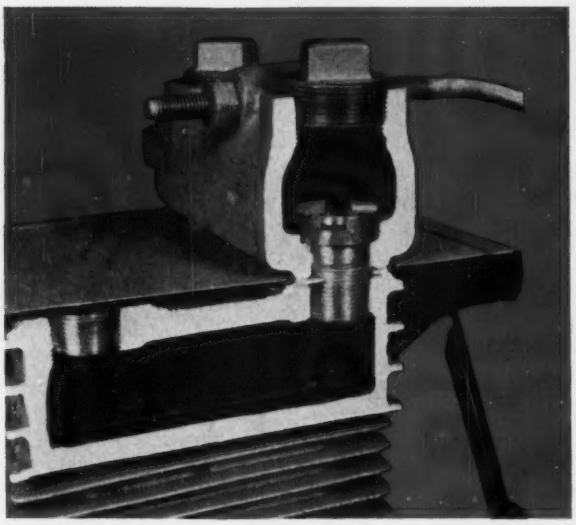

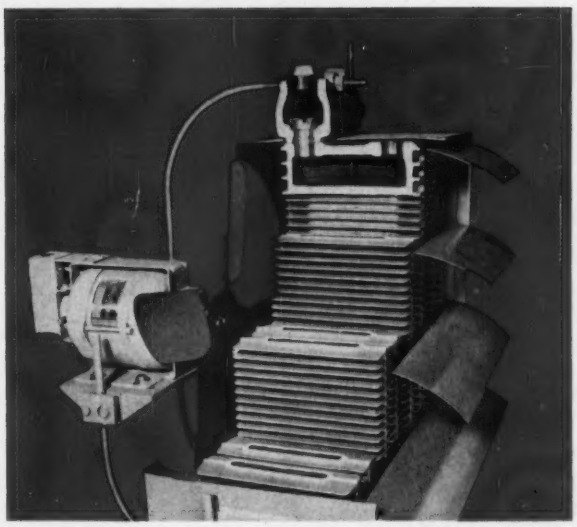

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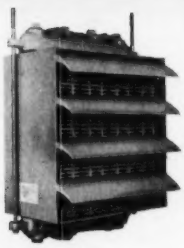

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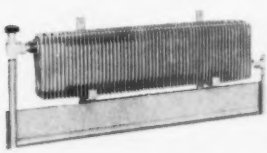

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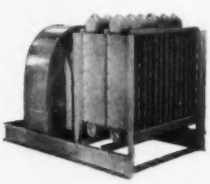

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GRID one piece cast iron steam chambers and headers eliminate internal corrosion . . . There's only one metal in contact with steam. No electrolysis is developed internally to eat away the heating elements. No leaks from rotted cores. And, GRID is leak-proof on steam pressures up to 250 P.S.I. 450° temperature. Specially designed units available for use on super heated steam.

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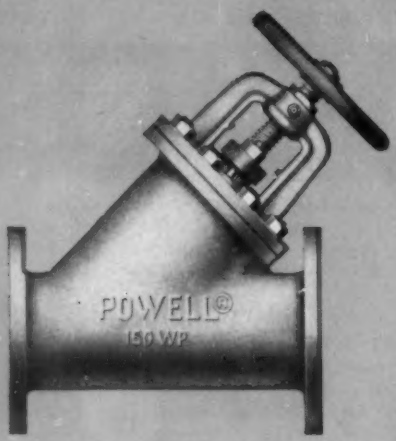
150-pound Stainless Steel Horizontal Swing Check Valve—Fig. 2433SS. Bolted, flanged cap. Renewable disc, integral seat. Sizes, 2" through 12". Screwed end valves available.



150-pound Stainless Steel "Y" Valve—Fig. 1944. Bolted flanged yoke-bonnet, outside screw rising stem. Renewable disc, integral seat. Sizes, 4" through 8".

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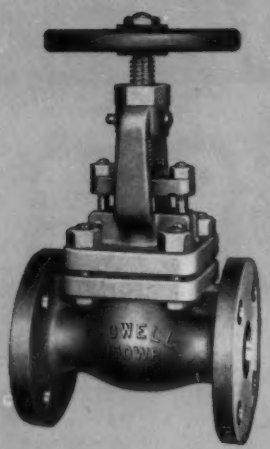
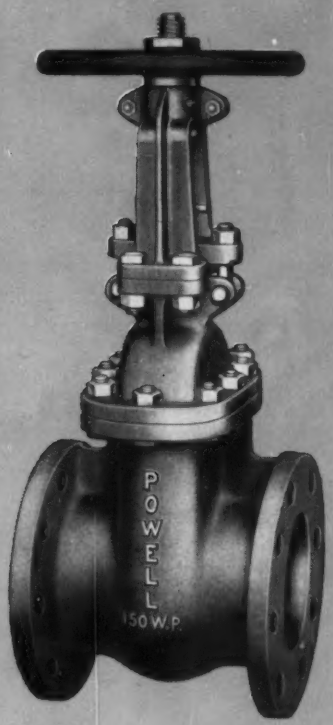


150-pound Stainless Steel Globe Valve—Fig. 2475. Bolted flanged yoke-bonnet. Outside screw rising stem. Renewable plug type disc, integral seat. Sizes, ¼" through 3".



150-pound Stainless Steel Gate Valve—Fig. 2453. Bolted flanged yoke bonnet, outside screw rising stem. Fully guided interchangeable solid or split wedge—integral seat. Sizes, 2½" through 18".

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Hovering helicopter moves a tank of chemicals close to burning woodland in test of fire-fighting agents.

Chemical Fire-Fighters Blaze New Trails

Chemical companies in both the U.S. and Canada this week are looking forward to the soon-to-be-released results of a large-scale field test of fire-fighting chemicals recently concluded by the U.S. Forest Service at Riverside, Calif.

USFS ran air drop tests to check mixing and handling properties of two new fire retardants—diammonium phosphate (DAP) and an ammonium sulfate clay—also tested two water-thickening agents. This chemical quartet, aside from strengthening the fire-fighting arsenal, could open the market far beyond its current size —about 8 million gal./year of chemical slurries are now used.

If the tests show promising results for the fire retardants, those materials might snare some of the markets now dominated by sodium calcium borate (specifically, U.S. Borax's Firebrake) and bentonite (colloidal clay). Borate has been in use since '56 and bentonite since '59. The DAP and the sulfate clay (Arizona Fertilizer Inc.'s Firetrol) will compete directly with these; the thickeners—a kelp derivative and a sodium polypectate material made by Ventura Coastal Lemon Co. (Ventura, Calif.)—give the fire retardants the viscosity needed to help them cling to vegetation.

What in Blazes: The market for these products is ripe for expansion. Forest fire-fighting agencies are eager to try any material promising to help cut the multimillion-dollar toll taken by woodland blazes each year. Although damage varies, depending on weather conditions, 4-8 million acres of private and public forest are destroyed by fire in the U.S. each year —and this year may be one of the bad years. Lightning, which starts about 70% of fires in the West, has this year started 2,000 fires, compared with 800 in '60.

Canada has had a particularly bad year, especially in the provinces of British Columbia and Newfoundland. Estimates are that direct fire losses (the value of the wood alone) there will come to more than $300 million this year—about 700 million cu.ft., with an average value of 40¢/cu.ft., have been destroyed.

Fire-Fighting Fertilizer: Diammonium phosphate (which contains 21% nitrogen, 53% phosphate) appears to have several features recommending it as a fire fighter. Besides having fire-retardant characteristics it offers the bonus of a residual fertilizer effect—it stimulates grass growth once it's washed off foliage. Other fire "retards," say the boosters of DAP, can actually sterilize soil, cause stream

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contamination and erosion.

Although borate, the material most used for air-lifted fire fighting, has been known to affect vegetation adversely in some cases, it has the edge over DAP in several important respects. For one it's less expensive—cost per gallon is about 17¢, compared with 21¢ for DAP. Also, it is simpler to handle. It costs 6¢/gal. to get DAP mixture (15% DAP by weight) to the viscosity of corn syrup, necessary to make it cling to vegetation (by adding algin—$1/lb.—and small amounts of calcium chloride). Four pounds of dry borate, when slurried in a gallon of water, is heavy enough (without thickeners) to adhere to vegetation.

Heavyweight Champions: Proper viscosity is important to chemicals used in fighting forest fires. By simply thickening water, for instance, it is possible to reduce the time needed for initial knockdown of fires as well as to hold down reignition. At the recent American Chemical Society meeting in Chicago, Cornelius Grove of Syracuse University maintained that a fivefold increase in rate of fire extinguishment could be achieved with viscous water as the flame suppressor. His work indicates that plain water applied at 3.6 gal./minute averages 3 lbs./minute runoff.

For carboxymethyl cellulose-treated water (viscosity of 5.5 cp.) the runoff was only 1.5 lbs. With water thickened (also to 5.5 cp.) with Dow Chemical's ET-460-4 (now being tested) the runoff rate dropped to less than 1 lb./minute.

Grove calculates that by using a 50¢/lb. thickener, it would cost less than 1¢/gal. to produce water of the viscosity necessary to fight forest fires. On a poundage basis, he figures that using 0.2% additive would call for 16 lbs. of the thickener/1,000 gal. of water. This obviously presents bright market prospects to makers of thickening agents.

Help from Helicopters: As important as chemicals are in fire fighting, they're not fully effective unless they're properly applied. In fact, speed and height at which chemicals are air-dropped are probably more important than chemical properties in successful fire fighting. In tests run by California's Division of Forestry and cooperating groups, it was shown that dropping 800 gal. of bentonite from 50 ft. at 100-mph. airspeed provided an effective coverage (2 gal./100 sq. ft. is minimum) of 6,840 sq.ft.; at 150 mph., only 980 sq.ft. were effectively reached. With borate (using 100 gal. of slurry and airspeed of 80 mph.), increasing dropping height from 50 ft. to 100 ft. cut the effective area covered from 915 to 142 sq.ft.

Since a small load dropped from low height and at reduced airspeed can be more effective than large loads dropped at high speeds, it's obvious why helicopters are getting a lot of attention for fire-fighting roles. Recently, for instance, production was begun on a new type of tank that doubles (and in some cases trebles) the amount of chemicals that can be handled by a 'copter. The new tank (made by Jeb Aircraft of Long Beach, Calif.) allows a Model G Bell helicopter or Hiller equivalent to carry 105 gal. of chemical—enough to treat a strip 20 ft. wide, 150 ft. long. Its pinpoint accuracy may allow chemicals to be used for forest fire fighting that are impractical now because of drift, rate of release, or evaporation problems.

Future Promise: The U.S. Forest Service, responsible for fire prevention and fire fighting on federal lands, is constantly on the alert for new chemicals to help combat forest fires, and will field test any material showing promise. The agency feels that present materials are not completely up to the job. Specifically, its investigators cite such drawbacks as the comparatively high cost of borate (sometimes as high as 60¢/gal., delivered to a fire); the difficulty of spraying bentonite; the corrosiveness problem with phosphates.

The current trend of research at the Forest Service is toward basic studies of the nature of burning. Forest Service officials feel that only with fairly complete knowledge in this area can they begin to look for the tailor-made chemicals that will do an effective job.

FS research efforts now cost about $1.5 million annually, supplemented with funds from state forestry services, which rely on federal agencies in this field.

With both private industry and government agencies working on more efficient products, fire-fighting chemicals should be an area of warm interest in coming years.

CW PHOTO—JOAN SYDLOW

UCC's Hartley and Husted direct new propellant marketing move.

Push for Propellant Blends

This week Union Carbide Chemicals Co. (New York) will make a major change in its aerosol propellant marketing picture. The company, now No. 3 factor in the propellant field (after Du Pont and General Chemical Division of Allied Chemical), will add two new propellant blends, plus hydrocarbons and nitrogen to its Ucon line of fluorocarbons. (It's also said to be adding vinyl chloride as well.) This move should provide Carbide with the widest propellant line available to the U.S.'s billion-dollar aerosol field.

The new custom blends, according to Thomas M. Hartley, sales manager of Ucon propellants, will include: Ucon Paint Propellant, and Propellant A, for use in hair sprays, insecticides and room deodorants.

The paint propellant's composition is 75% Ucon 12 (dichlorodifluoromethane), 10% Ucon 11 (trichlorofluoromethane) and 15% dimethyl ether. It's said to have better compatibility with resin solutions than straight fluorocarbon-12, to be completely free from flammability dangers at all temperatures, and to cut (because of higher expansion) by up to 7% the amount of propellant needed for paint pressure packaging. Cost of the material: 0.238¢/lb. in tank-car quantities.

Propellant A is a mixture of 45% Ucon 11, 45% Ucon 12 and 10% isobutane, is said to offer a 2-3¢/lb. savings over blends of straight fluorocarbon propellants 11 and 12 and can be used in the same products.

E. E. Husted, manager of UCC fluorocarbon marketing, says the two new propellant blends are designed to provide economies over straight fluorocarbons without requiring any alteration in filling equipment. For the fillers interested in setting up hydrocarbon filling lines, Carbide offers technical assistance.

Reactions Mixed: Among the contract fillers, CHEMICAL WEEK finds mixed reactions to Carbide's move. Peter Clapp, vice-president of Western Filling (Los Angeles), says the need for lower-priced propellant has existed since the aerosol business was in its infancy and that many fillers had to make sizable investments in

No area can be all things to *all* industries. But we've got down-to-earth facts that prove the Toledo-Northwestern Ohio area is right for Chemical Process Industries. These facts are reported in a study of the area by Fantus Research, Inc., one of the nation's foremost industrial location services. If you would like to evaluate this information in terms of your plant location plans, write R. E. Johnson, Manager, Industrial Development Department, The Toledo Edison Company, Toledo 1, O.

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their own plants in order to handle hydrocarbons. Many of those with investments in equipment, facilities and know-how, he feels, will prefer to continue doing their own blending.

Western Filling has such facilities, uses propane, isobutane and normal butane with fluorocarbons. It is also using hydrocarbons alone as propellants for water-based products, including glass cleaners, starches, furniture polishes. Clapp says that when hydrocarbons (which cost about 15-30¢/gal.) alone are used, the propellant cost for a typical 14-oz. unit is about ½¢/unit. If conventional fluorocarbons were used—e.g., a mixture of 60% 114 propellant (dichlorotetrafluoromethane) and 40% propellant 12—the cost would be 3-4¢/unit.

Sylvan Lefcoe, president of Par Industries (Los Angeles), has also blended his own materials, has been able to cut propellant costs from about 25¢/lb. where pure fluorocarbons are used to 5-6¢/lb. in the case of a fluorocarbon-hydrocarbon blend. Unlike Western, Par welcomes preblended material, although the company has invested considerable capital in setting up explosionproof machinery, sparkproof floors, and other safety equipment and devices. Main gain: extra safety.

The factor of hydrocarbon safety is one of the aerosol industry's major ones now. The New York City Fire Dept. last week said it plans to ban sale of all aerosol products containing flammable gas in New York City—and gases regarded as flammable include butane, propane, isobutane and other hydrocarbons. This move, according to Jack Ellis, president of Sprayon Products (Cleveland), could affect other marketing areas, create chaos in the industry.

Conceivably, it could affect Carbide's plans for marketing a full line of propellants, but the company has made no alterations so far.

Disregarding the New York hassle, which the aerosol industry may be able to straighten out (it has had similar problems in the past in Philadelphia and won out), it looks as if Carbide has faced up to the fact that aerosol fillers are determined to bring down the cost of propellants in one way or another. The move may well trigger other propellant makers to move into preblends in a general, join-them-not-fight-them effort.

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Eastman

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"The customer had reached me at home on the Labor Day weekend with a request for immediate delivery of 4,500 gallons of 2-ethylhexyl alcohol," said one of our New England representatives.

"I almost knew before asking that he was not going to define *immediate* as Tuesday or Wednesday. And he didn't disappoint me.

"'If a truck drove in right now, it would be an hour late,' he said. Then he went on about a very special and unexpected plasticizer order and how he was 'way short on the necessary 2-ethylhexyl alcohol and normally his raw material inventories were adequate and if he could get delivery right away he might be able to keep his process running, etc. So I promised to see what I could do.

"Luckily, I was able to catch our warehouse manager at home and after checking around he seemed to think he could get up a loading crew. I called the customer back to ease his mind a little... that just as soon as we could locate an available tank truck we'd be in business. That's when he told me about his faith in our service—he had already made arrangements for the tank truck.

"Within two hours we loaded and delivered. The customer confided later in the week that it was on time after all, and enabled him to meet his scheduled delivery date."

Generally, we handle orders on a more scheduled, normal-business-hours, few-days'-notice basis. But if ever you feel the need to arrange for your own tank truck, then call us to fill it up—we'll do all we can to meet your requirements, even on Labor Day weekend.

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ENJAY

Washington
Newsletter

CHEMICAL WEEK
October 7, 1961

The Du Pont relief bill was stymied by a handful of senators, plus the weariness of a Congress that wanted to go home. Barring any changes in the situation, however, chances are good that the bill will be passed by the Senate when it comes up for consideration Jan. 15. Proponents had enough votes to approve the measure last week but failed in their efforts to bring the matter to a floor vote.

The legislative maneuvering on both sides of the question was hectic in the closing days of the Congressional session. Senate Finance Committee Chairman Harry Byrd (D., Va.), supported by Robert Kerr (D., Okla.) and John Williams (R., Del.), had the bill before his committee even before it was enacted by the House. It was approved at a night session of the committee—most unusual for Byrd.

This, perhaps, was the key mistake made by proponents. Senate Democratic leaders and "neutrals" began to feel that the bill was being steam-rollered through. So, Sen. Albert Gore (D., Tenn.), leader of the opponents, found fertile ground when he argued there was no need to hurry since the court had not yet decided how Du Pont should dispose of its 63 million shares of General Motors stock.

Several days before the session ended, Senate Democratic Leader Mike Mansfield (D., Mont.) agreed to bring the bill to the floor, with one stipulation: if debate would unduly prolong Senate adjournment, the matter would be put over to January. This virtually invited Gore and his supporters to try to talk the bill to death. As the Senate adjourned with dawn breaking over the Capitol, the Du Pont bill was the only unfinished piece of business on its calendar.

•

Truckers of dangerous chemical-petroleum products won a point in preliminary skirmishing over a federal investigation of train-truck accidents. They succeeded in getting the Interstate Commerce Commission to postpone the question of whether private, nonregulated vehicles carrying dangerous materials should be registered with the commission. Hearings will open Oct. 25 on the remaining issue—whether new safety regulations are needed to reduce accidents between trains and trucks carrying explosive, radioactive, flammable, poisonous or other dangerous materials. The railroad and rail unions requested the inquiry.

•

First industrial contract for an advanced gas centrifuge separator has been awarded by the Atomic Energy Commission to Garrett Corp.'s AiResearch Division (Los Angeles). Present centrifuge technology to separate fissionable U-235 isotopes from U-238 is not economically attractive. AiResearch hopes to change this through its $750,000 AEC contract. The award also is regarded as a positive step in private industry's campaign to loosen the strict government proprietary controls over gas centrifuge methods.

Washington Newsletter

(Continued)

A little life has been breathed into the boron fuels program. The Air Force had canceled the research being conducted at Callery Chemical Co.'s plant in Muskogee, Okla. But after a conference of interested parties, including officials of the National Aeronautics and Space Administration, the Air Force decided that there was enough potentiality in boron rocket fuels to continue the small-scale Callery program. Another minor research program is under way to develop an engine that can withstand boron fuels.

•

The huge amount of red tape involved in defense procurement is the subject of a new Air Force-contractor study. Involved are the major defense contractor trade groups—National Security Industrial Assn., Electronics Industries Assn. and Aerospace Industries Assn. The idea, of course, is to find ways to simplify and improve military buying. The trade groups are working up recommendations to improve contract pricing techniques and reporting requirements for contractors.

One chief goal is to consolidate or remove the mass of "boilerplate" clauses in defense procurement contracts. These set forth basic conditions for doing business with the government and cover such standard but legally complex questions as military security requirements, use of convict labor, preference for domestic commodities and reporting of royalties. One idea is to place such clauses in a special pamphlet to be supplied to all contractors, then make brief reference to them in specific contracts.

•

A unified training program for defense contracting personnel is being set up by the Defense Dept. to simplify military procurement procedures. Until now, each of the services has conducted its own procurement training programs. Under the new setup, each service will conduct, each in its own specialty, training courses for all military procurement officers. A tentative schedule of 14 such joint courses has been established.

•

The so-called "agency shop" has been ruled legal by the National Labor Relations Board—at least in states that do not outlaw union security agreements. This decision, involving a number of union contracts in the chemical process industries, is a direct reversal of an earlier NLRB ruling handed down during the Eisenhower Administration. Under an agency shop, nonunion workers are required to pay the union sums equal to dues and fees as a job requirement. But they do not have to join the union.

NLRB ruled by a 4-1 vote that such clauses are not a violation of the Taft-Hartley Act. The specific case involved a General Motors contract with United Auto Workers for workers in six Indiana plants. Although Indiana has a "right-to-work" law, this question was not involved since the state already had declared such clauses legal. The NLRB decision does not cover the question of agency shop clauses in other right-to-work states.

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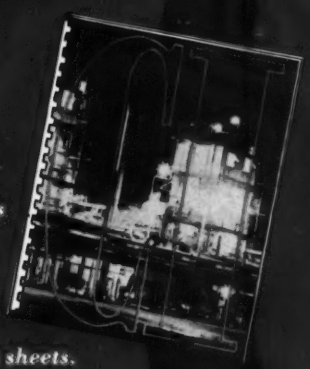

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SARCO TOPICS

WHY THE BIG STRAIN?

It's tough to keep gases and liquids "clean" as they run through a pipe. They drag impurities along, which can make even plain water a trouble maker, let alone more sophisticated fluids. That's because water, as a liquid or steam, is intimately involved with vital equipment like steam traps, temperature regulators, or tools. Meters, burners, nozzles, and pumps, too.

By this time you must realize we're going to talk strainers, don't you? A good, stout subject, of interest to all who feel production belongs up and costs belong down. Sarco makes strainers for water and condensate, steam, oil, air, gas and other piped fluids . . . dozens of different sizes and types and ratings of strainers to match every application need. Even our line of plain and simple strainers is built for super service. These are pipeline strainers, types AT, BT, and CT, which are designed for 250, 250 and 600 psi non shock, respectively, and 475°, 450° and 750°F. temperature ratings. Standard screens are heavy-gauge, perforated brass or stainless steel. Sarco specializes in screens that can withstand abnormal pressure differentials created by accumulated sediment.

Next, Sarco's flanged strainers, type D. These come in larger sizes, right up to 12", and are available in standard or extra heavy types.

And finally, *Sarco scraper strainers*, manual or motorized. These are the really eye-popping models, and if you can't use one yourself — well — you'll just have to get your kicks elsewhere.

Examples? Take Inland Steel Company at East Chicago, which gets water from Lake Michigan to cool its large air conditioner condensers. The water used to pass through traveling screens, but still contained fine sand. Clogging!

Heat under collars! Frequent cleaning required! Sometimes practically no air conditioning on hot days. (Isn't that always the way?)

The Inland Steel people installed Sarco Rotary Scraper Strainers, Type VRS, which incorporate a hand-operated helical scraper knife within the cylindrical strainer screen. A few turns of the crank at regular intervals, and the sand is scraped off the screen, blown clear, and discharged at pressure through a manual valve to waste. Dismantle the strainer? Shut down the unit? Not *this* strainer!

Now, as long as we've come this far, it's only a hop and a skip to the Firestone Tire and Rubber Co. in Akron, Ohio, who also use water in tremendous quantities. They circulate it through tire presses and a cooling tower, and there's no nonsense about it. It *has* to be clean or damage to equipment could be downright catastrophic. When the plant

modernized and enlarged, Firestone replaced their 4" Sarco hand-operated scraper strainer, type VRS, with a larger Sarco 8" model. And while they were about it, they got the motor-operated type, for continuous cleaning.

When we say that companies like these want the insurance of a Sarco strainer, it sounds like advertisingese, but sometimes there just isn't any other way to put it. Sarco strainers *are* insurance at low cost on the operation of your high cost equipment. So when we ask if you have lumps in your pumps, or worries over your slurries, we're *serious*. We've heard everything in the straining line, so why not write us for literature and answers to those special problems you have.

A T-44 IS THE BEST POLICY

Sorry, but we can't leave the subject of insurance without bringing to your attention one of the best little insurance policies any company requiring cooling control could invest in. It's the *self-powered* Sarco T-44 Automatic Cooling Control. No compressed air or electricity is needed, but its advantages are best described in terms of three different plants of just one Sarco customer — Revere Copper and Brass, Inc.

Revere-Baltimore, Md., has cut water use 40 to 50% with T-44's. But in addition to former water waste, Revere had even more problems: possible wet air from uncontrolled cooling of compressor aftercoolers, plus sweating compressor cylinders; variations in viscosity of hydraulic oil and bearing oil; gas generator water waste; unreliability of manual shut-off of water supply when machines were down.

If your ears perk up in sympathy at mention of any of these problems, the results of Revere's cooling control program should bring you to full attention. One large compressor that had gulped 2400 gallons per hour now takes only 420 gallon sips. In addition all the problems itemized above were solved. T-44's are now used on their air compressors, gas generators, and hydraulic oil systems. At Revere-Riverside, Cal., water savings of 50% were experienced, and at Revere-Rome, N. Y., substantial savings were made too.

But after all, wasting water is only one way of wasting money, so let's go on to another matter of interest: the evils of manual control. When cooling water is controlled by hand the temptation to leave the valve nearly wide open is almost overpowering, in order to play it safe if the load varies. Result: overcooling, of course. And varying the flow runs the risk of undercooling. In either case, lowered process efficiency. Answer: The automatic Sarco T-44, which can't be tempted, is meticulously honest, unsentimental, and plain inhumanly practical when it comes to cooling control. You really ought to write for literature. T-44 is your best policy.

SPARE PARTS INSURANCE

As long as we're near the end, and still on this subject of insurance, may we graciously leave you with this valuable tip? No matter how closely a steam trap approaches perfection, some gremlin may cause it to act up. It's conceivable. So, keep on hand a parts list and spares of key parts for your steam traps and other system components. Parts are small and worth their weight in gold when you need them. A Sarco field engineer will make up a suggested list for you, if you tell us what components make up your system.

Might as well even keep a disc or two on hand for your Sarco Thermo-Dynamic Steam Traps, Type TD-50, even though they're so trouble-free our salesmen keep complaining about the lack of replacement parts business. We'll be glad to tell you about this unique steam trap in case you still don't know how miraculously simple and effective it is.

Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both — to the point where you'll communicate.

5903

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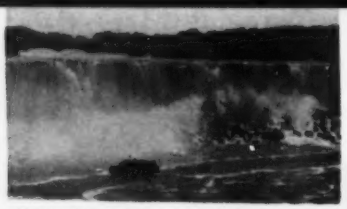
Multicolored reflections of Castlegar, B.C., plant of Celgar Ltd. (Celanese affiliate) highlight precious resource . . .

water

Individual company survival may hinge on finding answers to the long-term problems of supply, stream pollution.

CW SPECIAL REPORT



CW SPECIAL REPORT

water

The welfare of the chemical process industries is keyed to solution of perplexing water problems. Here's the big picture—(1) our national water resources; (2) saline water conversion; (3) stream-pollution control activity.

Every search for a new plant location brings up questions of short- and-long-term water supplies; every new manufacturing process must be evaluated in terms of waste product disposal to avoid running into conflict with local and federal agencies. To this point it's a familiar story; industry has learned how to cope with these more or less traditional problems.

Beyond that, what are the new responsibilities that industry must face in the years ahead? What stand should industry take in support of—or in opposition to—major water projects such as dam and aqueduct construction, saline water conversion, water pricing, pollution control? To what degree should CPI firms—individually and collectively—enmesh themselves in local and national politics bearing on water resources development and pollution abatement?

The answers won't come easily. All vital areas of water use and conservation—not to mention pollution control—are rife with contradictions, conflicting "expert" opinions, political demagoguery, and honest confusion resulting from insufficient knowledge.

There is, however, reasonable certainty on some points; for example, that water consumption in this country climbed from about 40 billion gal./day in 1900 to roughly 320 billion gal./day now (*chart, p. 52-53*). It's less certain that an estimated 600-billion-gal./day consumption in '80 will become fact—but it's probably the best information now available.

Suppose that the '80 estimate is reasonably correct. What does that mean in terms of the nation's manageable water supply put at 1,160 billion gal./day? Most of the water withdrawn for use is returned to the nation's aquifers for reuse—often reused many times over; only a relatively small part is actually "consumed" (i.e., nonreturnable).

It means there is enough water for the nation's needs for several decades—even if tapping of inexhaustible ocean reservoirs is discounted. The outlook for year 2000 is far more worrisome. There will be enough usable water only if problems of quality improvement, distribution, pollution control, etc., can be solved. Some of these solutions will be costly.

The following regional case histories have been selected to illustrate the types of problems that are now cropping up throughout the country—and to show what methods are being used to explore and solve them.

Water Politics: Doubtless, chemical processors will be drawn into active participation in regional water-planning programs. A timely and important example of such activity is U.S. Borax & Chemical's energetic support of California's controversial Feather River Project.

First phase of U.S. Borax's role came during the '60 national and local elections when the company urged its employees to support—in referendum—so-called Proposition 1, a proposal to authorize issuance and sale of bonds amounting to $1.75 billion to finance the Feather River water project and the related Southern California aqueduct.

The firm explained to its employees—through its company house organ *Pioneer*—that water supply "is a matter of grave concern to U.S. Borax because our boron plant, located in the heart of the Mojave Desert, cannot operate without an adequate future supply of water. Although the supply for the present and for some years to come is estimated to be sufficient for continued operations, we must look to the proposed Feather River Project as an assurance for water when existing sources are depleted." U.S. Borax stated that the firm "unqualifiedly endorses Proposition 1."

Although the bond issue was voted in, state-wide, that did not mean U.S. Borax and others in Kern County would automatically get Feather River water. Existing water agencies cannot negotiate with the Feather River Authority—hence elections on Sept. 26 were to decide if a master agency would be set up for this purpose.

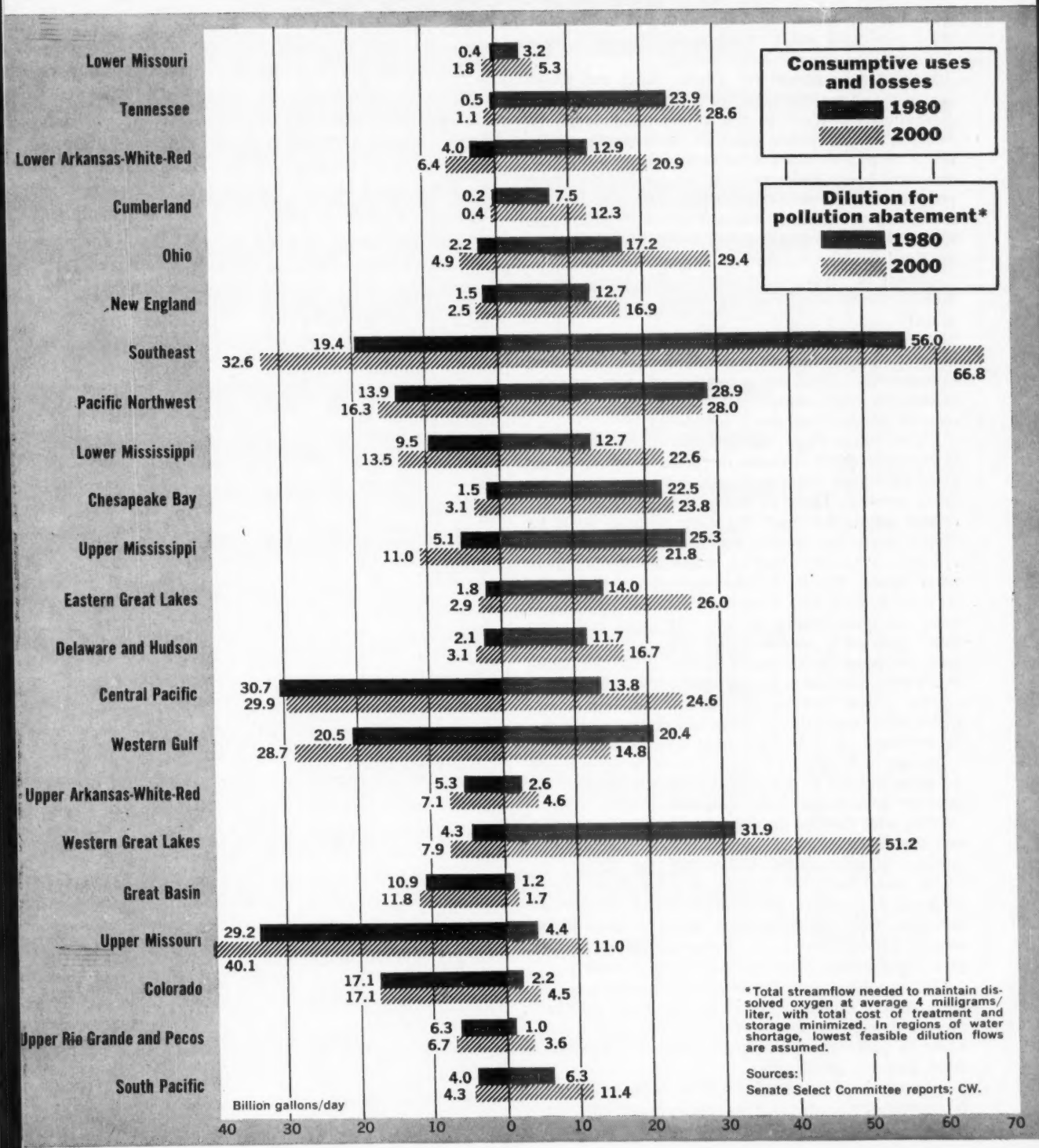
Voting down the master agency would be tantamount to rejection of the Feather River Project and the area would get none of its water. Hence U.S. Borax again planned "to get out the vote," remind its employees that the future of the company depends on assurances of adequate water supplies.

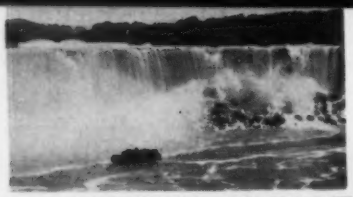
As *CW* went to press word was that a 2-1 vote put the agency into existence—a move that was not actually very surprising. Reason: the area is suffering from extensive drought (third year in a row and the driest in history). With local rivers down 15% from normal, residents need little additional proof that new water supplies will be needed.

Feather River—No Lightweight: Size of the Feather River Project has stirred up a commensurately big controversy. Capital expenses alone have been estimated at $3 billion—roughly equal to cost of TVA and more than 21 times greater than New York's $140-million Cannonsville Project. Cost of California's complete water plan is estimated at upward of $13 billion.

Another comparison: the present authorized flood control program of the Corps of Engineers consists of over 900 projects having total estimated federal cost of $8.8 billion. About $1 billion worth of these projects are being restudied, leaving $7.7 billion active. Between 1918-60 $4.59 billion in federal funds have been appropriated for flood control; work completed or under construction

Predicted Regional Water Requirements





CW SPECIAL REPORT **water**

amounts to $5.7 billion in federal funds and more than $500 million in local costs. This program entails about 87 million acre-feet of flood control storage in 219 reservoirs, over 9,000 miles of levees and floodwalls, about 7,400 miles of channel improvement.

Political Monuments? The Feather River and similar dam-aqueduct projects come under considerable fire from many quarters. Water experts at the Rand Corp., for example, brand Feather River as "premature" and the source of very expensive water to be sold on a taxpayer-subsidized basis. (The same group labels saline conversion prospects "overblown.") Tendency of local, state and federal agencies to think of dam and aqueduct constructions as the only solutions to water problems is considered by the Rand group as indicative of a "monument syndrome" (penchant of politicians for projects that permit use of commemorative plaques to record their deeds for posterity.)

Right or wrong, approval of Feather River and other big projects shows that critics like those at Rand are being swamped by enthusiastic supporters of dam projects. Nonetheless their proposals for alternate cures of water resource problems are worth considering.

Higher Prices First? Rand's water experts argue that California's official estimates of future water needs are based on simple addition of projected agricultural and urban demands. That's all wrong, they say, because this method ignores the "fact" that water demands would be "highly responsive" to price changes.

Suggested formula: establish prices on now available water supplies that would reflect true cost of the Feather River Project. The Rand people believe agricultural water use would decline at least 50%, and urban use would drop 40% compared with the state's estimates. Such reductions would permit deferment of new aqueduct construction for at least 10 years.

Other experts disagree, insist that even if prices were tripled water would still be cheap and demand would not be depressed—or at best depressed only temporarily.

Farmers—who get a very special break in water prices —yelp in response to such thinking; and politically oriented water departments generally concur.

What price benefits do California farmers get? Rand says the state's irrigation farmers account for 90% of demand. In the Imperial Valley they pay $2/acre ft. (about 0.6¢/1,000 gal.); Los Angeles and other nearby cities pay $25/acre ft., wholesale, then tack on distribution costs, which boost consumer prices to about $80/-acre ft. (24.6¢/1,000 gal.). Moreover, urban wholesale prices are expected to soar to $80/acre ft. or more.

That growing of many low-value crops would be severely curtailed or eliminated doesn't seem to worry the Rand experts; they figure that water should be used mainly where its profit-earning power is highest (i.e., high-value crops, industrial production).

Although the Rand group puts most emphasis on price hikes, they don't overlook other methods of water conservation. Such techniques as control of reservoir evapo-

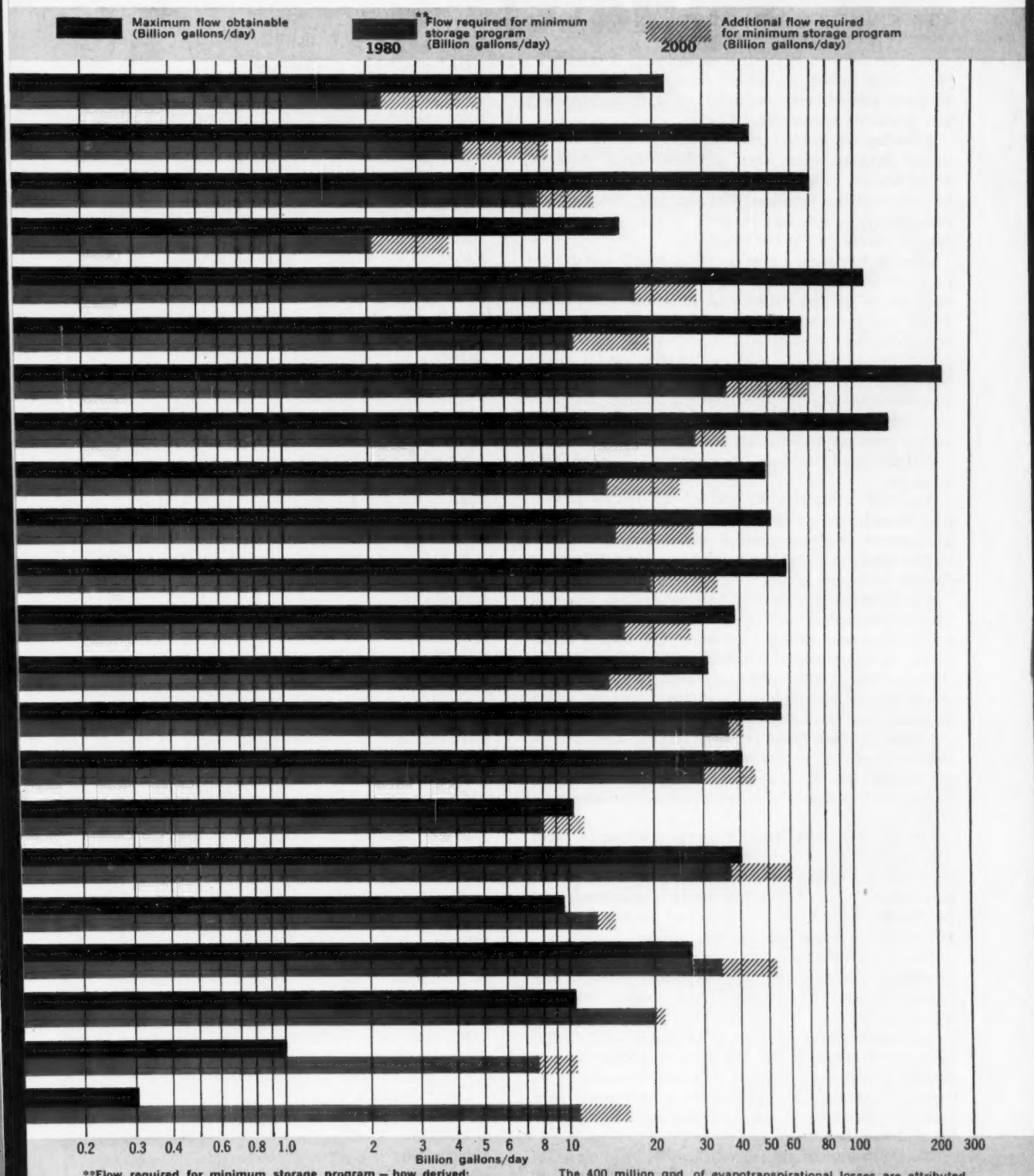
U. S. Water Storage

Order of rank		Ratio: Supply/demand*		Area
1980	2000	1980	2000	
1	3	10.0	4.4	Lower Missouri
2	2	9.9	5.0	Tennessee
3	1	8.9	5.6	Lower Arkansas-White-Red
4	4	7.3	4.1	Cumberland
5	5	6.4	3.9	Ohio
6	7	6.2	3.3	New England
7	8	5.7	3.2	Southeast
8	6	4.7	3.8	Pacific Northwest
9	9	3.6	2.0	Lower Mississippi
10	10	3.5	1.9	Chesapeake Bay
11	11	3.1	1.8	Upper Mississippi
12	13.5	2.4	1.4	Eastern Great Lakes
13	12	2.3	1.6	Delaware and Hudson
14	13.5	1.5	1.4	Central Pacific
15	15.5	1.4	0.9	Western Gulf
16	15.5	1.3	0.9	Upper Arkansas-White-Red
17	17.5	1.1	0.7	Western Great Lakes
18.5	17.5	0.8	0.7	Great Basin
18.5	19.5	0.8	0.5	Upper Missouri
20	19.5	0.5	0.5	Colorado
21	21	0.14	0.1	Upper Rio Grande and Pecos
22	22	0.03	0.02	South Pacific

*Supply/demand ratio indicates how many times maximum obtainable flow exceeds (or falls short of) flow required to maintain a minimum storage program.

Examples: ratio of 10 means obtainable flow is 10 times greater than requirement, hence indicates a supply abundance; ratio of 1 means obtainable flow just matches requirements; ratio of 0.5 indicates a water shortage because obtainable flow is only half the volume of requirements.

Forecast of Regional Supply/Demand Balance


Maximum flow obtainable (Billion gallons/day)
**Flow required for minimum storage program (Billion gallons/day)
1980
Additional flow required for minimum storage program (Billion gallons/day)
2000
0.2 0.3 0.4 0.6 0.8 1.0 2 3 4 5 6 8 10 20 30 40 50 60 80 100 200 300
Billion gallons/day

**Flow required for minimum storage program – how derived:

Example: Lower Missouri in 1980 will require an estimated 2.2 billion gal./day of flow to maintain a minimum storage program. This total volume includes 400 million gal./day for evapotranspirational losses and 1.8 billion gal./day for waste dilution needs (assuming a biological treatment balance of municipal and industrial water that will minimize volume of dilution water required and still provide degree of stream purity represented by a dissolved oxygen content of 4 milligrams/liter).

The 400 million gpd. of evapotranspirational losses are attributed to various withdrawal uses (agriculture, 202 million gpd. mining, 0.4 million; manufacture, 27 million; power, 0.5 million; municipal, 27.9 million) and to estimated increases over '54 base figure for on-site needs (i.e., a total of 171 million gal./day for land treatment and structures, fish and wildlife). The total losses of 429 million gpd. are rounded off to 400. Similar detailed regional analyses and explanation of other complex factors involved in these estimates are explained in Senate Select Committee print No. 32 on Water Resources.

ration losses by use of chemical films, industrial recycling of water, ground water recharge are, to them, promising and preferable approaches.

Resolving the Differences: One noteworthy step toward clearer thinking about water problems was a proposed comprehensive program presented at the Interstate Conference on Water Problems (Chicago, Dec. '60) by Vice-President Irving Fox and research associate Henry Caulfield of Resources For the Future, Inc.

Crux of their plan: a new system of benefit-cost evaluation for water investment to de-emphasize benefit-cost ratio *per se* as key criterion of economic worth. They would pay more attention to impact on economy—national, state and regional.

But they would also seek to broaden use of prices and charges as a means of allocating supplies among alternative uses. Some possibilities: tax effluent discharge into streams, impose more fees on recreational water uses, impose taxes on withdrawals for various purposes, and re-evaluate need for local underpricing, irrigation subsidies, etc.

And they would consider whether the federal government should move away from planning, management and development programs—toward greater emphasis on research, regulation, and financing of water development through loans and grants.

Also proposed for thoroughgoing evaluation: the economical efficiency of electric power industry. Reason: the public vs. private power controversy has been a major barrier to improvement of water resources management.

One of the toughest problems would be to find study groups acceptable to both state and federal agencies, which frequently find themselves at odds with each other.

Federal Control: There are some tangible signs that an improved spirit of cooperation is developing between state and federal authorities—at least in some regions and concerning some aspects of the national water resources program.

The Delaware River Basin Program is a case in point. After many years of bickering, legislation providing for a federal-state, five-way compact has been approved by the legislatures of New York, New Jersey, Pennsylvania and Delaware. Congress has okayed it and the bill has gone to President Kennedy for signing.

The agreement permits the federal government to be a one-fifth partner with the four states—as originally proposed—but gives it veto power over projects involving federal spending.

State authorities tried hard to minimize federal influence in the compact, but had to make concessions in the end. Likewise, the Dept. of Interior had to give up its demands that publicly owned power groups would have priority in purchase of electricity generated by dams in the Delaware Basin.

The Delaware Commission will base its plans on a $2-million study of the area made by the Army Corps of Engineers. The Corps has selected 19 major dam projects from a list of 193 potential projects, and 39 recommended minor projects from a list of 386 potentials. Eleven of the 19 major projects and all minor projects are expected to be completed by year 2010. The Corps recommends authorization of eight major projects at an early date.

The four-state area will need 96 million kw. of generating capacity by year 2010, compared with 34 million kw. in '80 and 11.1 million kw. in '57.

Water needs in the Delaware area are expected to quadruple by year 2010 (end of the 50-year period considered in the study). A total of 14 billion gal./day of water will be needed in the four states by that time. Available water will account for 8.5 billion gal./day and the rest will come from the Delaware. Reuse of some of this cuts the need to 1.4 billion gal./day, which the Delaware water plan would meet.

The Delaware plan also calls for flood control, navigation and recreation benefits.

Gulf Coast: Industrial Oasis

Some of this country's water experts confidently predict that the Gulf Coast—extending from the Mississippi to the Rio Grande—will rank first in the U.S. as user of water for industrial purposes by year 2000 if industrial growth continues unchecked.

Will there be enough water available to permit the Gulf Coast area to attain its industrial expansion potential?

The U.S. Senate Select Committee on National Water Resources concluded that the western Gulf region will have a surplus of water until '80 but will suffer a deficiency by the year 2000 (*graph, p. 52-53*).

Other independent study groups concede the possibility of water dearth, but say that shortages will be limited to inland and extreme southern portions of the Gulf area. Along the coast—especially in the Houston area—water supplies are expected to be abundant and easily obtained.

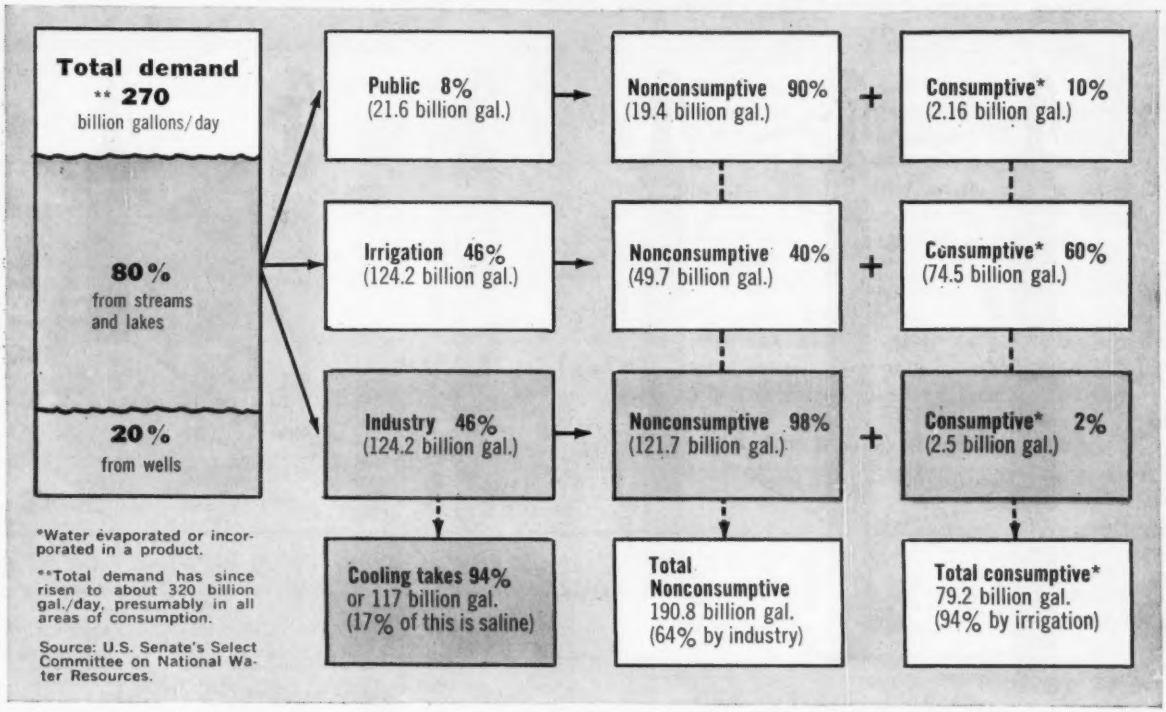
The enterprising Texas National Bank recently commissioned Houston consulting engineers Lockwood, Andrews & Newnam to prepare a regional water survey. Here's what they foresee:

The Houston industrial area (75-mile radius from the city) will probably have a surplus of some 700 million gal./day of water in the year 2000. Reservoirs to be built by '66, say the engineers, will boost available water supply by 1.5 billion gal./day; an estimated 150 million gal./day more can come from wells if needed.

LA&N puts current water availability in the area at 1.8 billion gal./day; about 25% comes from more than 1,000 deep wells, and the rest comes from four of the state's major rivers. Right now about 325 million gal./day of that water is available for new needs.

Other reservoirs planned for four rivers in the area will increase the total water supply for the Houston area to more than 4 billion gal./day by the year 2000. Moreover, industry is expected to take over a greater share of now available water supplies as urban growth expands into rice fields, which now use almost 1 billion gal./day for irrigation.

U.S. Water Uses—Industry Takes a Big Share

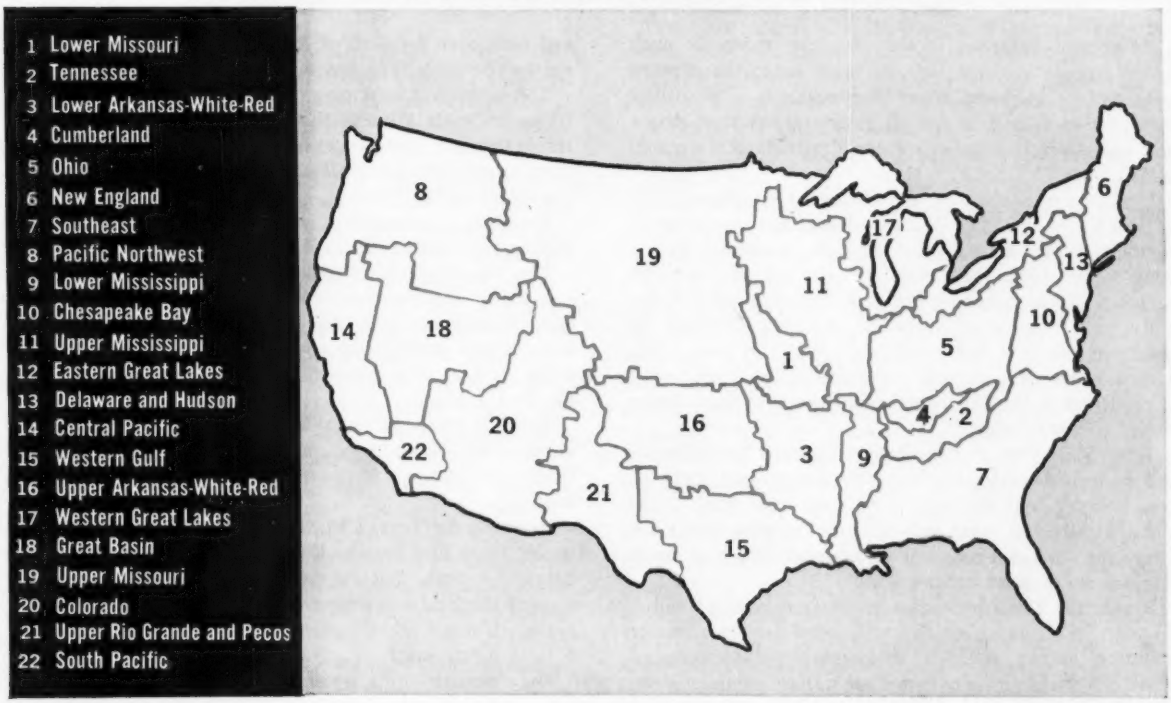


*Water evaporated or incorporated in a product.

**Total demand has since risen to about 320 billion gal./day, presumably in all areas of consumption.

Source: U.S. Senate's Select Committee on National Water Resources.

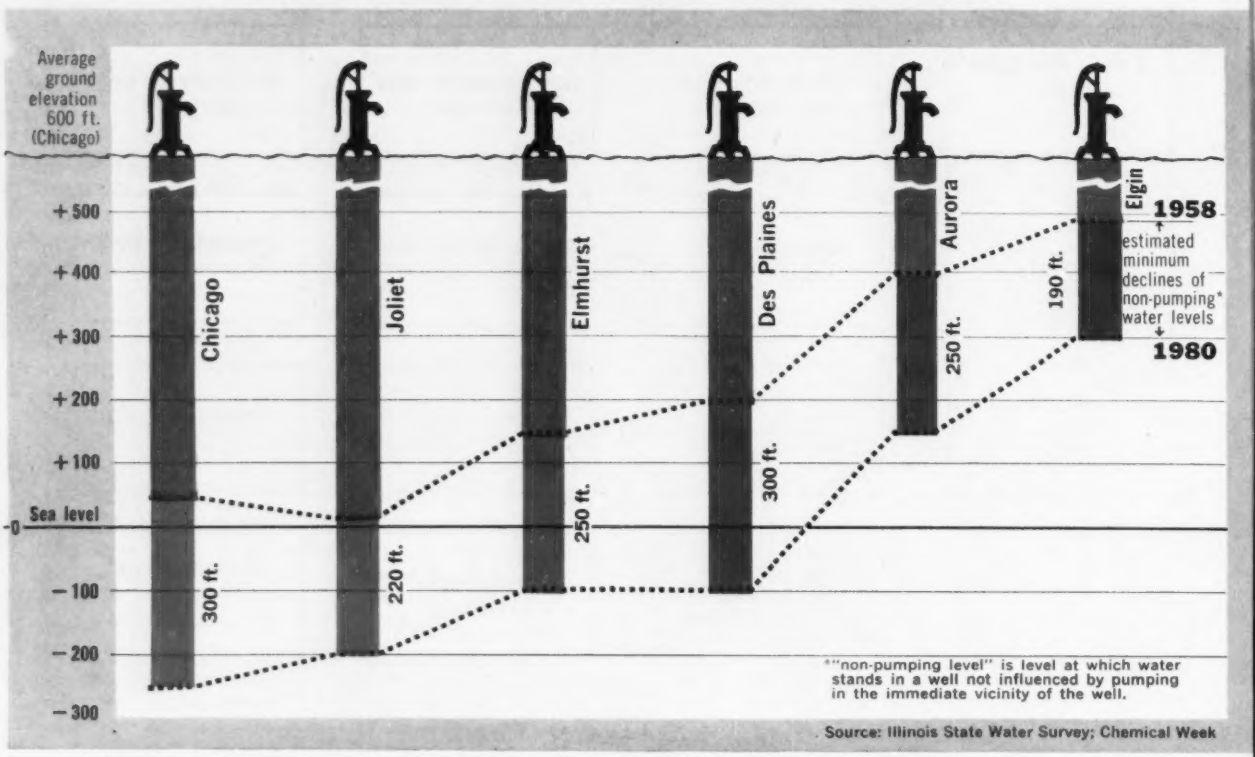
Location of Major U.S. Water Resource Regions



CW SPECIAL REPORT

water

Ground Water Wells Go Deeper in the Chicago Area



Source: Illinois State Water Survey; Chemical Week

At present irrigation in the area uses twice as much water as does industry. But 40 years hence the demand ratio will probably be more than reversed as industrial uses soar to a level almost six times greater than irrigation uses—which will have dropped significantly (*graph, p. 59*).

If the water outlook for the Houston area seems bright to LA&N and the Texas National Bank, there seems to be plenty of reason to publicize the view. According to another water study made for the city of Houston by Brown & Root, industries are now bypassing the city for other areas because of supposed or actual shortages of water; in the past few years, says B&R, at least $500 million worth of industrial development has been lost—in particular to the Mississippi industrial strip from Baton Rouge to New Orleans.

Texas also knows that inadequate planning for industrial and municipal waste disposal often discourages entry of new industry into the state. One case cited: east Texas lost a $10-million paper mill because the state could not assure the interested company of adequate means of waste disposal under strict control laws.

Result: the Texas legislature last August passed a bill—20 years in the making—that will speed control of water pollution in the state; a six-member pollution-control board will wield power over surface waters, ground waters, and even over the Gulf of Mexico to the limits of Texas territorial waters. The law becomes effective Nov. 1, '61.

The board will issue permits limiting and controlling all forms of waste disposal that would allow polluting materials to reach Texas water aquifers. The act also specifies that permits can be revoked if violations are found and proved at public hearings.

Louisiana's industrial water use jumped from 1,940 million gal./day in '50 to 3,750 million gal./day in '55.

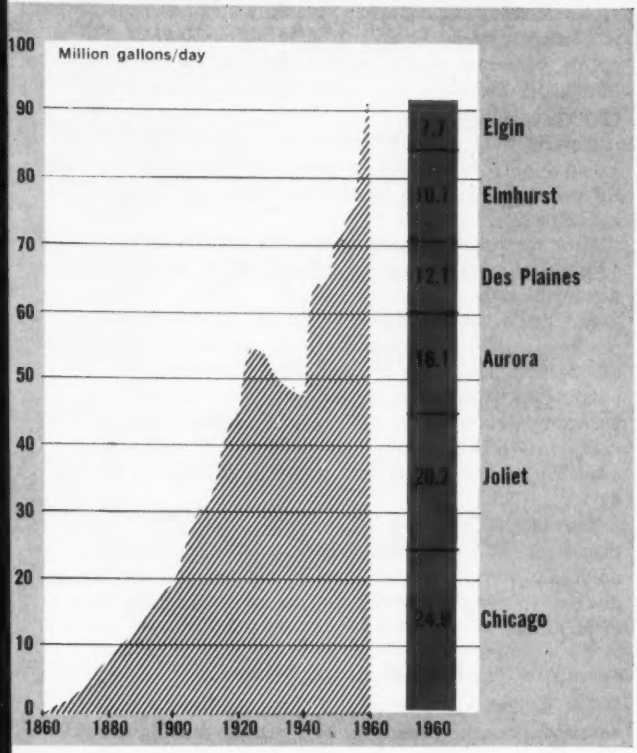
The Mississippi River makes Louisiana a land of water abundance and the state touts itself as the best supplied area in the country. During average flow 65 times more water moves through the river than is used in the entire state; on days of minimum flow 15 times more is available than is used.

There is plenty of water for industry in Louisiana provided it can be controlled and moved to areas where it is needed. Biggest future problem: what to do about wastes.

Problems for Texas CPI: Several decades ago industries in the Texas City area took their water supplies from underground wells; but in the mid-'40s elevation surveys showed the land was dropping because of lowering water tables—Union Carbide's plant, for example, had dropped 5 ft. in a few years.

Only answer: bring water in from other areas. Hence

Deep-Well Pumpage (Chicago Area)



Union Carbide and American Oil created the jointly owned but independently run Galveston County Water Co. (Carbide's investment: $1 million plus $2 million for a water treating plant to clean up the turbid, hard Brazos River water.)

Since then the Galveston County Water Co. has contracted to supply water to other users, including Monsanto, the government, a tin smelter, Sid Richardson Refinery, Kelso Building Material Co. and Texas City Chemicals.

More recently other CPI firms have been getting into water development projects. For example, Dow Chemical teamed with other interests on the lower Brazos (Briscoe Irrigation, Richmond Rice Assn., South Texas Water Co.) to help the Brazos River Authority sponsor an engineering study by Freese, Nichols and Endress (Fort Worth). Resulting recommendations may lead to construction of a new, $67-million reservoir at Navasota, Tex.

Also, development of the Houston industrial complex should be spurred by the recent decision to harness the waters of Trinity River (on the border of Texas and Louisiana), costing about $60 million—$40 million for a dam, the rest for other facilities, including a salt-water barrier downstream from the dam. The city of Houston, under contract with the Trinity River Authority, will finance the project, which is expected to provide 1.2 billion gal./day of high-quality industrial water.

Texas Thinks Big: The Texas Board of Water Engineers recently gave the state legislature a comprehensive plan for meeting the '80 water requirements of the state. The report includes estimates of each area's '80 municipal and industrial water requirements.

Total water use in Texas in '59 was 14.6 million acre ft.—1.13 million by municipalities, 770,100 by industries, about 12.7 million acre ft. by agriculture. Combined municipal and industrial use in '80 is expected to climb to almost 6.55 million acre ft.; 20% of the water will probably come from ground aquifers, 80% from surface sources.

Of the many Texas water basin projects considered, those of greatest interest to the CPI are plans for the Trinity, San Jacinto, Sabine, Neches, Canadian, Brazos and Colorado rivers. These projects would involve building of a host of dams and related facilities.

Aid for the Water 'Deserts'

In the era ahead many traditional water concepts must be abandoned or modified.

Water experts point out, for example, that the most intense U.S. water-desert area is Manhattan and Long Island (New York). Second most severe shortage area is an 11-county region in northeastern Illinois, bordering Lake Michigan. The driest part of Arizona has 10 times greater per-capita precipitation resources.

Predictions that the Great Lakes region may face serious water shortage problems in the future (*graph, p. 52-53*) seem paradoxical; but there are many valid reasons for concern.

Practically unlimited quantities of water can be withdrawn from Lake Erie to inland places; but because the lake is part of an international boundary, it's not permissible to divert its waters outside the Lake Erie Basin—a restriction that limits use of lake water to a specific geographic area (for example, about 29% of Ohio's land area).

Another factor: major increases in water demand are directly attributed to need for massive volumes for diluting and washing away rapidly increasing amounts of municipal and industrial waste material (*graph, p. 51*).

Chicago accounts for the major part of total municipal water use in Illinois; the state now consumes about 1.5 billion gal./day. Chicago's use isn't likely to remain stabilized at the present rate forever—and certainly water consumption for the state as a whole will increase significantly. In fact municipal demand in the state is expected to double—to about 3 billion gal./day—by '80.

The city of Chicago now diverts 1,500 cu.ft./second of water from Lake Michigan to dilute and flush its wastes down the ship canal and Illinois River to the Mississippi drainage system and to aid navigation in the canal. This diversion (limited by U.S. Supreme Court order) is in addition to "unlimited" amounts of water drawn from Lake Michigan for normal municipal needs. Surprising fact is that since '30 pumpage by Chicago has not increased materially—in fact it may have dropped off somewhat despite added industry, a population increase of

CW SPECIAL REPORT

water

800,000, and current delivery of 120 million gal./day to 59 suburbs that received considerably less in '30.

The Chicago water department reports that in '60 pumpage was 1.028 billion gal./day, compared with more than 1.059 billion gal./day in '30. Reason: waste of water has virtually been eliminated, and all known underground leaks have been plugged.

Although total pumpage has declined, peak hour demand has gone up; moreover, in certain dry years consumption is likely to increase beyond the long-range average. For example, pumpage rate in '56 (a dry year) was 1,805 cu.ft./second, compared with 1,784 cu.ft./-second in '57 and 1,760 cu.ft./second in '58 (1 cu.ft./-second represents about 646,000 gal./day).

Lake-fronting states are trying to force Chicago to cease diversion of the lake water and want the city to return treated sewage to Lake Michigan. Reason: diversions from the lake area allegedly impair shipping, hydroelectric generation, and property values. The U.S. Public Health Service is conducting studies to determine what sewage-return to the lake would mean in terms of pollution problems.

On the other hand, Chicago wants to divert more lake water to boost the present 1,500 cu.ft./second limit put through the ship canal. In the past the city has requested permission to withdraw larger amounts "for experimental runs"; proposed bills were killed by Presidential veto.

Theoretically the regional water shortages could be eliminated by using the lakes themselves for waste disposal—but capacity of the lakes to absorb waste, in terms of water runoff, is still poorly understood.

Of course, municipalities, industries and navigation already dump considerable amounts of waste into the Great Lakes; protests are mounting rapidly and control agencies are issuing threats of fines and imprisonment to offenders, as incidents—some scandalous—become more numerous.

Underground Problems in Chicago: Because use of Great Lakes water is limited, hundreds of wells have been drilled in Illinois, including the industrial area surrounding Chicago.

Five major pumping areas are located within a 40-mile radius of Chicago; they center on Joliet, Elmhurst, Des Plaines, Aurora, Elgin.

Total water pumpage from wells in these areas climbed from 200,000 gal./day in 1864 to 91.7 million gal./day in '60 (*graph, p. 56-57*).

Well water pumped in the Chicago area jumped 3.7 million gal./day in one year ('59-'60); that was modest compared with the 9.7-million-gal./day surge that occurred in the preceding year.

Alarming predictions about declining water levels resulted from an Illinois state survey in '59—subsequent rechecks indicate the problem is worse than expected. Hence estimated '80 ground water levels (*graph, p. 56-57*) are probably conservative.

Water level declines averaged 13 ft. in '60 (ranging from 11 ft. in Elgin to 18 ft. in Des Plaines); this compares with an average 10-ft./year decline between 1945-59. Total pumpage in '59 and '60 has already exceeded the withdrawal rate anticipated for '65.

A safe bet: pumping levels exceeding 1,000 ft. in depth will be common in the Chicago area within 20 years. Chicago's problems typify similar troubles cropping up throughout the country in areas where wells are important water sources.

Current total pumpage in Illinois is about 12.5 billion gal./day—8.7 billion for power generation, 2.2 billion for industry, 1.5 billion for municipal uses, 0.1 billion for agriculture.

How does that compare with water supply? It's about 13% of the total average precipitation of 99 billion gal./-day in the state.

But that's not the whole story. Of the 99-billion-gal. precipitation, 76 billion returns to the atmosphere through evaporation and plant transpiration. The remaining 23 billion gal., when added to minimum flows from Illinois-bordering sections of the Ohio and Mississippi rivers, and diversion from Lake Michigan, brings total mean daily available surface and ground waters to 43 billion gal./-day.

That means that potentially available water still is more than triple the current demand. Apparently, then, there is no need to worry if the water can be controlled, conserved, diverted to the right places, and be kept reasonably free of pollution.

Battle over Brine

The nation's saline conversion program has been plodding along for the better part of a decade, making steady gains but doing little to catch the public eye; one demonstration plant is now operating (Freeport, Tex.) and two more are due onstream in Nov. '61 (*chart, p. 68-69*). So far no construction contracts have been awarded for the remaining two projects that round out the nation's initial five-plant demonstration program.

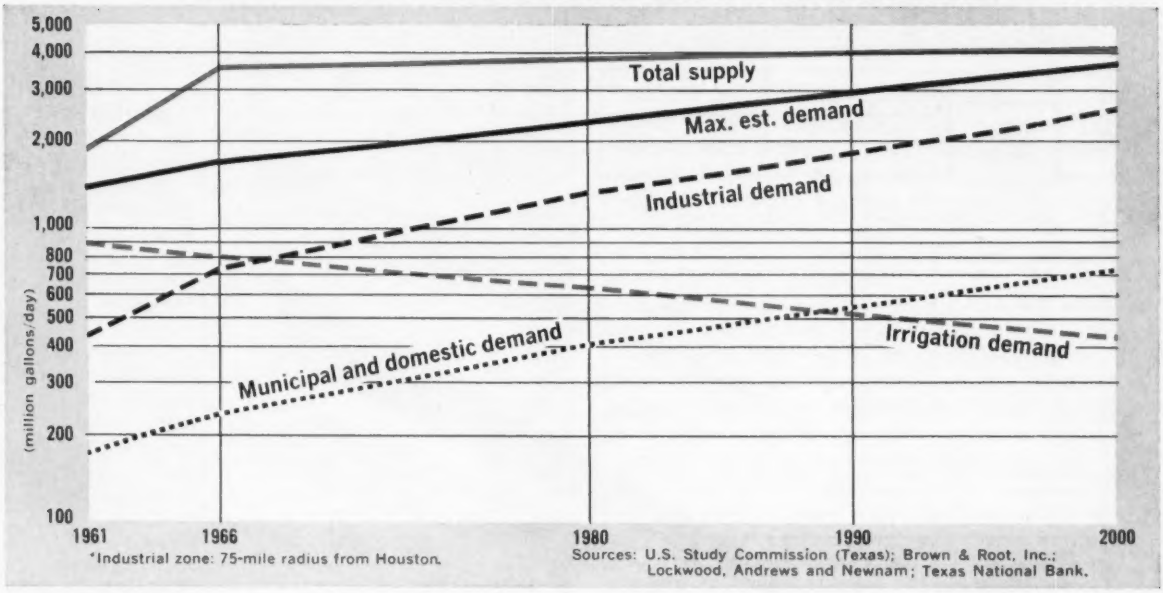
Saline water conversion during the Eisenhower Administration was a small-budget affair—since '52 approximately $16 million was appropriated for combined research and demonstration-plant building.

But President Kennedy is clearly impatient. He plugged saline conversion twice during the inauguration and has kept his Administration working for a large-scale program ever since.

Kennedy told the Interior Dept.'s Office of Saline Water to "think big." They did—too big in fact for a House of Representatives Interior Committee, which—under leadership of Wayne Aspinall (D., Colo.)—deflated OSW's $100-million plan to half the size by recommending extension of the program for five years with a relatively small, $50-million authorization. Moreover, the committee scrapped four of the five titles in Kennedy's proposed bill—those dealing with demonstration plants, loans, grants, and foreign assistance.

The House committee left one tight loophole. Parts of the demonstration plant plans were incorporated into the approved bill with the provision that when OSW wants to

Predicted Water Supply/Demand Balance in Houston Area*



*Industrial zone: 75-mile radius from Houston.

Sources: U.S. Study Commission (Texas); Brown & Root, Inc.; Lockwood, Andrews and Newnam; Texas National Bank.

build a plant it may come to the committee—plans in hand—to ask for approval. Purpose: to insure Congressional control over the controversial program.

The committee's attitude was consistent with the House's penchant for favoring research and development rather than construction.

The Senate Interior Committee—under the chairmanship of Clinton Anderson (D.., N.M.), and traditionally more interested in plant building—restored most of the plan rejected by the House. The final compromise: $75 million for a six-year research program.

OSW's Big Ideas: The three-part program that OSW recommends, but won't immediately get:

(1) Build 13 demonstration plants during the next four years, ranging in size from 250,000 gal./day to 25 million gal./day and employing 10 different processes. Total cost would be $82.6 million—$52.9 million of this directly for construction.

OSW's schedule: $10.9 million for three plants in fiscal '63, $13.5 million for four plants in '64, $10.8 million for three in '65 and $17.7 million for three in '66.

(2) Loan program of $25 million—$5 million/year for fiscal '63-'65 and $10 million in '66. This program is expected to grow bigger as OSW perfects conversion plants.

(3) Grants totaling $33.3 million to aid depressed communities in building vital water projects. The schedule of budgets would be about $4 million for five plants in fiscal '63, $8.2 million for five more in '64, $11.3 million for nine plants in '65 and $9.7 million for six in '66.

Where will future saline conversion plants be located if OSW gets Congressional clearance? These are the more likely locations and plant sizes (all figures in million gal./day) now envisioned: Brownsville-Port Isabel, Tex., 1.6; Tampa Bay Area (Bradenton), 0.6; Key West, Fla., 1.6; Elizabeth City, N.C., 0.6; Virginia Beach, Va., 0.3; Atlantic City, N.J., 3.5; Suffolk County, N.Y. (Long Island), 14; Wichita Falls, Tex., 3.5; Alamagordo, N.M., 0.3; Oklahoma City, Okla., 14.

Other areas that could get strong consideration include: Avalon, Antioch and Oxnard-Port, Calif.; Gloucester, Mass.; Portsmouth, N.H.; Onida and Lennox, S.D.; Lamar and Rocky Ford, Colo.; Safford, Ariz.; and various cities in Texas, Florida and southern California.

Conversion Intrigues: The inability of the House committee to muster much enthusiasm for saline conversion—especially plant building—contrasts sharply with widespread public interest in the idea.

Shortly after the first saline conversion plant went on-stream at Freeport, Tex., some 215 companies bought plant specifications (at $35/copy).

Response from local communities has been startling. In the past summer more than 200 communities expressed some interest in saline conversion and 91 were seriously seeking a plant. This reaction tends to support OSW's prediction that more than 1,000 cities will be forced to convert sea water (or brackish water) for drinking purposes within the next decade.

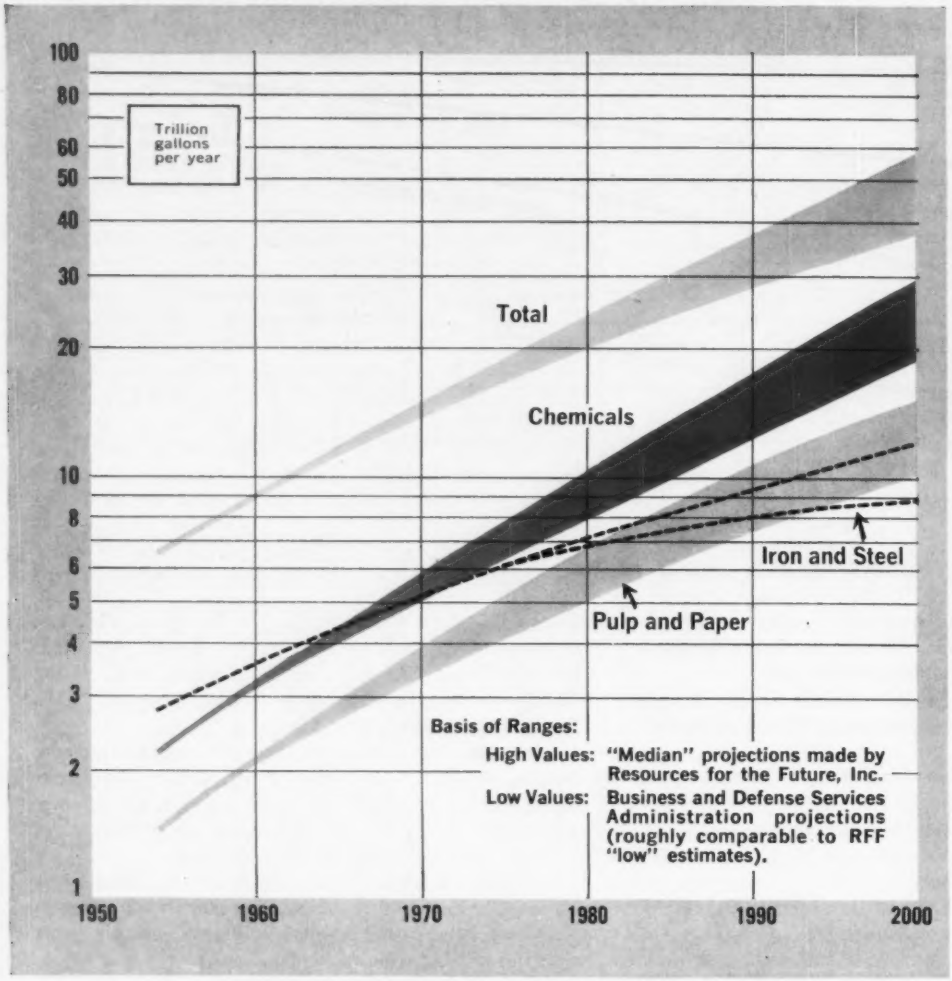
Even at this early stage, saline water conversion is getting conditional nods of approval from some state legislatures. For example, a California state senate fact-finding committee—following an unusually comprehensive hearing on saline conversion—recently concluded that there are many advantages to setting up locally based conversion plants in preference to costly transmission systems.

Some observers labeled the California committee's endorsement of saline conversion an indirect slap at the

CW SPECIAL REPORT

water

Future Water Intakes of Selected Industries



Water Needs of Major Users (est. billion gal./year)

INDUSTRY	1954[1]	1959[2]	1980[3]		2000[4]	
			RFF	BDSA	RFF	BDSA
Chemicals	2,380	3,210	10,800	8,040	29,700	19,300
Pulp and Paper	1,607	2,140	6,893	5,252	16,173	10,458
Iron and Steel	2,812	3,500	7,124	6,837	12,827	8,210
Food and Beverage	590	630	1,000	850	1,500	1,000
Aluminum (primary) total	263	278	605	—	1,139	—
For electric power	220	220	294	—	331	—
For reduction of metal	43	58	311	—	808	—
Copper (primary)	42	49	114	78	247	98

[1]From MC-209, "Industrial Water Use," 1954 Census of Manufactures.
[2]Estimate based on 1958-60 adjustment.
[3]Comparison of median projection by Resources for the Future, Inc., and projection based on FRB index of all industrial production adopted by Business and Defense Services Administration, U.S. Dept. of Commerce.
[4]Comparison of RFF and BDSA estimates.

Chemical Industr

REGION	
New England	
Delaware and Hudson	
Eastern Great Lakes and St. Lawrence	
Chesapeake Bay	
Western Great Lakes	
Ohio	
Cumberland	
Tennessee	
Southeast	
Upper Mississippi	
Lower Mississippi	
Upper Missouri	
Lower Missouri	
Eastern Arkansas—White-Red	
Western Arkansas—White-Red	
Western Gulf	
Rio Grande	
Colorado	
Pacific Northwest	
Great Basin	
Central Pacific	
South Pacific	
Total	

Pulp and Pape

REGION	
New England	
Delaware and Hudson	
Eastern Great Lakes and St. Lawrence	
Chesapeake Bay	
Western Great Lakes	
Ohio	
Cumberland	
Tennessee	
Southeast	
Upper Mississippi	
Lower Mississippi	
Upper Missouri	
Lower Missouri	
Eastern Arkansas—White-Red	
Western Arkansas—White-Red	
Western Gulf	
Rio Grande	
Colorado	
Pacific Northwest	
Great Basin	
Central Pacific	
South Pacific	
Total	

orecast: Regional Needs (billion gal./year)

1954[1]	1959[2]	1980[3]		2000[4]	
		RFF	BDSA	RFF	BDSA
41	52	135	101	260	170
237	308	864	643	1,920	1,250
352	459	1,320	987	3,060	1,990
144	194	636	474	1,710	1,110
167	218	630	468	1,450	944
495	646	1,860	1,390	4,310	2,800
14	18	53	39	120	79
152	200	600	447	1,460	951
102	145	596	444	1,920	1,250
38	50	145	106	330	214
41	60	273	204	940	608
10	13	42	31	110	71
1	1	3	2	9	6
29	38	114	85	270	179
8	12	54	40	180	120
471	693	3,150	2,340	10,800	7,010
1	1	3	2	10	6
1	1	3	2	9	6
27	36	112	84	290	189
4	5	16	12	42	27
33	44	144	107	380	247
10	13	42	31	110	71
2,380	3,210	10,800	8,040	29,700	19,300

orecast: Regional Needs (billion gal./year)

1954[1]	1959[2]	1980[3]		2000[4]	
		RFF	BDSA	RFF	BDSA
249	331	767	588	1,703	1,106
93	102	106	106	96	96
110	137	253	194	313	203
109	174	563	432	994	646
142	156	254	195	376	244
54	60	90	69	223	145
2	13	44	34	108	70
37	41	97	74	241	157
329	476	1,669	1,281	3,941	2,560
114	125	176	135	326	212
31	34	73	56	364	236
—	—	—	—	300	195
10	12	40	31	200	130
56	62	168	129	414	269
—	—	—	—	103	67
29	41	132	101	326	212
—	—	—	—	170	110
0.5	1	2	2	135	88
224	354	2,401	1,780	5,494	3,487
0.5	1	2	2	68	44
13	14	36	27	177	115
4	6	20	16	101	66
1,607	2,140	6,893	5,252	16,173	10,458

state's plan to spend $2-3 billion in the next 30 years on the Feather River Project, which would include long transmission systems to transport water from northern California to shortage areas in coastal and southern California regions.

Skeptics Decry 'Overemphasis': Moreover, some voices outside Congress have been raised in protest against extensive saline conversion plant construction by the government. Some industry spokesmen argue that normal competitive processes will bring about required technological improvements and cost reductions quickly enough; they see no need for federal participation except in research and basic development.

Not widely mentioned yet—but nonetheless a real possibility—is the fear that the government might eventually compete with private plants in much the same way that TVA and other federal power projects do with private industry. Many openly shudder at the thought that Washington might set up its own saline conversion plants as an "economic yardstick" to measure efficiencies (and profit margins) of privately operated plants.

Water experts at Rand Corp. are arguing that "among other technical alternatives the possibilities for sea-water conversion are overblown. There should be no objection to modest research and development programs exploring the potentialities of producing fresh water from the sea. However, nothing so far in the laboratory gives any indication of promising a source of supply by conversion for municipal, and certainly not for irrigation, use at costs that approach any but the extreme of many other technical and economic alternatives. Sea-water conversion processes are handicapped by high capital costs or by high power costs."

With respect to irrigation uses, at least, the Rand experts are undoubtedly on relatively solid ground (although some congressmen from agricultural regions reportedly are talking up saline conversion plants for farming areas).

Right or wrong, these various critics will probably be shouting into a storm when the sea-water program really begins to roll in; too many interested groups will be clamoring for action to permit an indefinite delay of the large-scale saline conversion program.

And President Kennedy continues to remind the country that saline conversion is more than just another business enterprise. It's keyed to national domestic welfare and is a top-level strategic weapon in the international struggle for friendship of underdeveloped nations. Fresh water, thinks Kennedy, can sink the sputniks.

Already Practical: Saline conversion is now an established "practical" activity in several places in the world—although total output is still relatively small. Right now an estimated 16 million gal./day of converted water is being produced with equipment valued at $75-100 million.

Production costs, of course, vary considerably. The U.S. Navy has been converting sea water to potable water aboard ships for many years; the cost of conversion aboard nuclear submarines is put at $5-10/1,000 gal.

The sheikdom of Kuwait, on the Persian Gulf, operates

a conversion unit with a capacity of about 4.73 million gal./day (Westinghouse is now increasing this to 5.23 million gal./day). Production cost: close to $3/1,000 gal. (new plant increments have much lower costs).

The town of Coalinga, Calif., has, for the past two years, obtained its total water supply from desalted water at a cost of $1.45/1,000 gal. (a substantial saving over the previous $7.05/1,000 gal. cost for rail-hauled water). But the plant has only 28,000-gal./day capacity—a 2-million-gal./day plant, to cover all Coalinga water needs would bring cost down to an estimated 40¢/1,000 gal., according to Ionics Inc., which built the small plant.

The Freeport, Tex., demonstration plant (operated by Stearns-Roger) is now converting water at about $1/-1,000 gal. and it's expected that costs will go still lower when bigger plants are built. But there are sparse hopes that any big production cost breakthroughs are ahead.

Incidentally, output of the Freeport demonstration unit is being sold to the city of Freeport for 30¢/1,000 gal. and to Dow Chemical for 40¢/1,000 gal. Obviously the government is recouping only some of the costs of running the experimental plant.

General aim now is to bring conversion cost down to the 40-50¢/1,000-gal. range. Japanese engineers already claim they have a freezing process that will convert at a cost of 35-45¢/1,000 gal. (*CW, June 24, p. 93*); this is roughly in line with other freezing-process costs estimated (but not yet proved out) at 38¢-$1/1,000 gal. The Japanese (Umano) process is licensed for sale in the U.S. and outside Japan by Clark Division of Dresser Industries.

And U.S. companies also claim improvements in conversion costs. Aqua-Chem (formerly Cleaver Brooks Special Products) has a new electrodialysis process to convert brackish water at costs said to be "substantially" below those of methods now in operation. (Aqua-Chem also makes flash-evaporation and vapor-compression sea-water conversion equipment).

Conversion costs of 54¢/1,000-gal. have been obtained at a no-longer-operating electrodialysis brackish-water conversion plant at gold mines in southwest Africa. The cost figure is based on a 15-year program for redemption of capital and accumulation of interest.

Electrodialysis equipment will not be used now for sea-water conversion; it's expected to find wide municipal and commercial applications in treating brackish-waters.

Aqua-Chem will engineer, manufacture and sell the new electrodialysis equipment at its Waukesha, Wis., plant, under agreement with the Netherlands research organization (TNO—short for Toegepart Natuurwetenschappelijk Onderzoek), which developed the process.

And just last week Ionics Inc. (Boston) revealed it had won a contract to build a 240,000-gal./day ($418,000) electrodialysis plant for the government of Kuwait. Although the plant will be the largest commercial electrodialysis unit so far commissioned, it is regarded by Kuwait as a pilot project. Other facilities of several-million-gal./day capacity may be installed in Kuwait in the future.

The contract went to Ionics in international competitive bidding. Bidders who lost out include an English-Dutch group and a Japanese firm (which suggests that the Japanese may have overreached themselves in earlier projects they won in the U.S.).

Cost Controversy: During the next year or two much of the uncertainty about saline conversion costs will begin to clear as demonstration plants go into operation. At the moment the Freeport plant commands most attention, but two more demonstration units will be ready soon.

The San Diego, Calif., multistage flash distillation plant is scheduled for completion on Nov. 3 of this year. After 75 days (or less) of testing—30 of which must be continuous run—the plant will be turned over to the operator.

The electrodialysis plant at Webster, S.D., is scheduled for completion on Nov. 9. It will have 120 days for testing —2,000 hours (83-plus days) of which must be continuous.

No construction figures or completion dates are available for the Roswell, N.M., forced-circulation vapor compression plant or for the Wrightsville Beach, N.C., freezing plant. Last month OSW figured completion of specifications for the Roswell plant would take at least 30 days and—allowing 60 days for bids—construction figures probably won't be ready until November of this year at the earliest. Wrightsville Beach plant estimates are still further off.

Of course OSW has a pretty good idea what these plants should cost, but won't give out figures because the agency doesn't want to give contractors a target figure at which to aim bids. The Interior Dept.'s appropriation bill passed a few weeks ago provided $4.55 million for operation of the demonstration plants in '62—plus $1.755 million for research and development.

Pollution Control—A Vital Factor

Not the least of the CPI's—and the nation's—water problems involve waste disposal. What, for example, is likely to happen to the synthetic detergents industry if water pollution by syndets (*CW, Aug. 19, p. 41*)—now turned out at a more than 1.5-billion-lbs./year rate—becomes a menace rather than the regional nuisance it is now? Conceivably, some of the more troublesome types of detergents (i.e., those slow to decompose after disposal) may eventually be banned locally if not nationally.

A recent *New York Times* editorial (July 31), "Controlling the Pesticides," underscores growing alarm; this influential newspaper decried "irresponsibility" of the industry in dealing with hazards of chemical insecticides.

The National Agricultural Chemicals Assn. promptly took issue with the *Times* stand (*Times*, Aug. 16) and listed many agencies that are publicizing hazards and explaining proper use of pesticides.

Unswayed, the *Times*, in rebuttal, flatly accused NACA of playing down pesticide hazards, insisted that the Food and Drug Administration "pays no attention to wildlife or water pollution problems."

Aside from pesticides, countless other chemicals (e.g., dyes, flavors, perfumes, 100 million lbs./year of potent synthetic medicinals, etc.) sooner or later reach the nation's water supplies.

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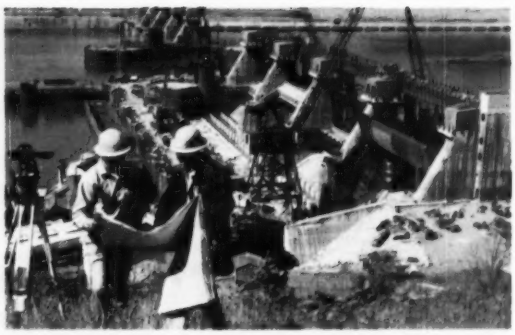
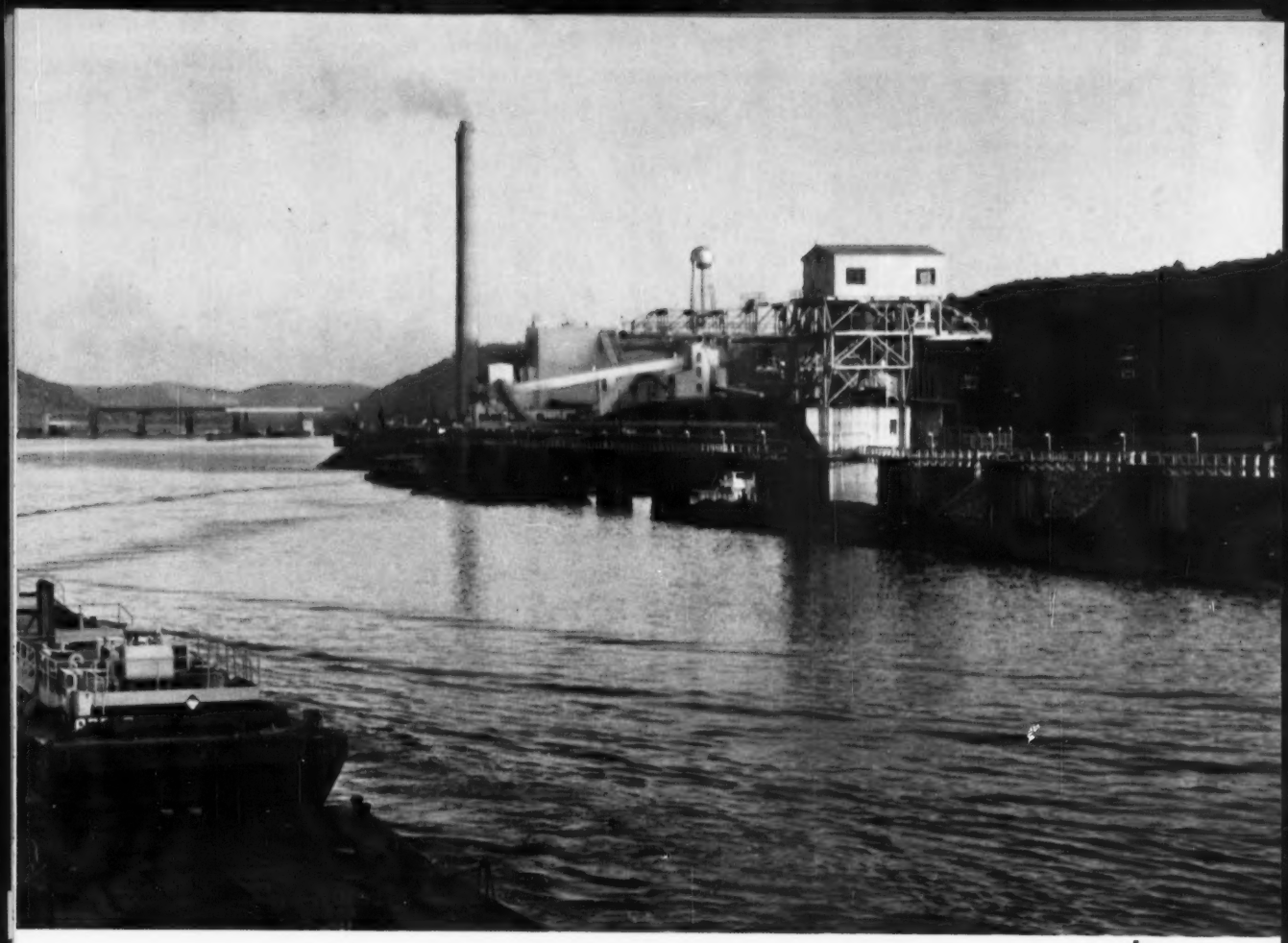


Marine construction experience includes giant dam and lock projects—commercial installations of all kinds.

Twin high-speed river towboats built for a New Orleans transportation company.



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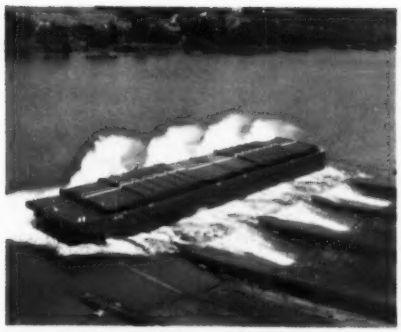

A covered hopper barge is launched at Neville Island shipyard.

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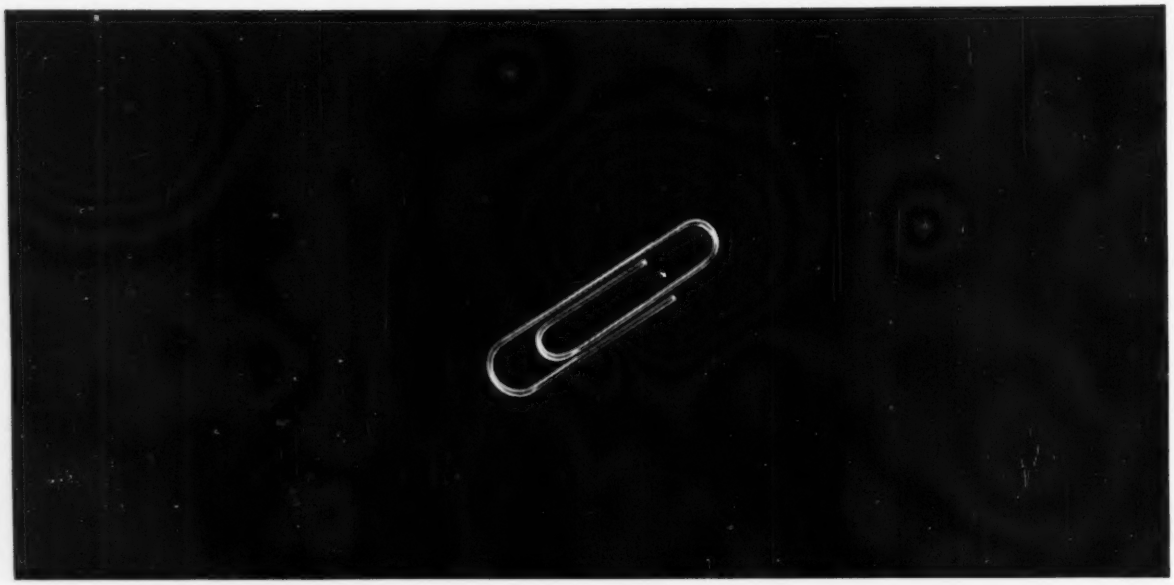

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CW SPECIAL REPORT **water**

That they do—and perhaps pose a health problem—is at least as much the fault of uninformed citizens as it is of the companies that make the chemicals or those that use them in other manufacturing operations.

Reason: the nation's municipal sewage treatment program is in a deplorable state—40 years behind times, according to one authority. Time and again vital sewage plant proposals have been shelved for political expediency or because an uninformed (or wrongly informed) public turned thumbs down during referendums.

The CPI can serve in several ways: control its own plant effluents, provide technical information about complex chemical products that will enable municipal sewage engineers to cope with difficult treatment problems, and participate in long-range research programs to devise new methods of waste control.

Grants for the Asking: The U.S. Dept. of Health, Education and Welfare is eager to provide contracts and grants for worthwhile projects and actively solicits applications from industry. But right now industry is largely passing these by. Last year there were 142 grants totaling $2.1 million; 95% went to universities, 4% to state health departments, and only 1% to industry and consultants.

Selected grants (*chart, p. 74*) show the diverse nature of the projects in progress; Public Health Service spokesmen emphasize that this is a "free kind of research" which gives the researcher considerable latitude in selection and conductance of programs.

A similar situation applies to federal research contracts (*chart, p. 75*), of which there are now 16 in progress; contract awards range from $25,000-$50,000, and emphasis is now on application of advanced methods of physical chemistry.

PHS figures that because of stringent economic restrictions, complex and highly variable character of water pollutants, their extremely low concentrations, and tremendous volumes of water involved, future pollution-control methods may come from new, unexplored areas of engineering application. Hence, rather than narrow the field of possibilities impulsively or arbitrarily, contracts are sought that explore, at least briefly, a wide range of potential solutions.

Physical-chemical separation processes being given initial consideration include: adsorption (on activated carbon, inorganic materials, synthetic polymers); electrodialysis; electrolysis; evaporation; extraction (of contaminants/or of water); foaming; freezing; hydration; ion exchange; oxidation.

A broad program is mandatory because there are so many "unknowns" involved in the problem. One example: best available data describes only about 35% of the soluble organic material present in waste-containing waters—and even this portion (except for alkylbenzene sulfonates) is known only in terms of rough categories—i.e., alkylbenzene sulfonates, 10%; ether extractables and proteins, each less than 10%; carbohydrates and polysaccharides, under 5%; tannins and lignins, under 5%; unidentified, 65%.

Metropolitan Areas' Average Supplies

	Million gallons/day		
New Orleans	417,962	Grand Junction	4,496
St. Louis	116,280	Spokane	4,412
Detroit	114,342	Cedar Rapids	1,996
Cincinnati	64,600	Houston	1,615
Kansas City	36,176	San Francisco	1,098
Little Rock	26,486	Indianapolis	1,049
Chattanooga	24,160	Phoenix	988
Sioux City	21,447	Dallas	879
New York	14,212	Los Angeles	711
Nashville	12,920	Albuquerque	672
Hartford	11,176	Denver	607*
Philadelphia	10,336	Lansing	557
Albany-Schenectady-Troy	9,302	Portland	484
Washington	7,493	Amarillo	305
Columbia	5,433	Fort Worth	265
Boston	5,155	Oklahoma City	242
Richmond	4,806	Salt Lake City	115
Birmingham	4,535	San Antonio	103
		Chicago	†

*Total potential supply when various projects are completed.
†Chicago supply is taken from Lake Michigan and is unlimited by decrees. Flow released to Chicago Sanitary and Ship Canal controlled by 1930 decree of U.S. Supreme Court (original ruling: not over 1,500 cu.ft./second, not including domestic pumpage; limit raised temporarily a few times). Net result: limitation on industrial use and not on domestic use.
Sources: Senate Select Committee report and Chemical Week.

Federal Pressure Mounts: The new Federal Pollution Control Act—underwritten to the tune of $570 million—is aimed at expanding and strengthening control of water pollution throughout the nation. It involves multimillion-dollar grants to states, counties, and local communities for building of water-treatment and sewage disposal facilities.

The grants total $80 million for the current fiscal year, $90 million for '63, and $100 million for each of the four following years. The legislation also authorizes $25 million—in $5-million annual increments—for federal research on water pollution.

The grants favor low-income states and set a $600,000 (or 30% project cost if smaller) ceiling on a state or local project.

The Secretary of Health, Education and Welfare is empowered to set up conferences on interstate pollution problems—and on intrastate problems when requested by state governors. In each case the Secretary can recommend remedial action—followed by public hearings in six months if the requested corrective measures have not been met.

In extreme cases the Attorney General can bring suit against a community or industry believed to be transgressing.

Republicans in general found the compromise bill unpalatable, criticized it for being too extreme. They argued

that the legislation would tread on jurisdiction of states in managing their own water problems—an argument that re-echoed opinions expressed by former President Eisenhower when he vetoed a similar bill last year.

In the forefront of organized opposition to the federal program was the National Assn. of Manufacturers, which lobbied energetically against the bill. NAM urged repeal of the existing grant program, not simply defeat of the expanded version.

To NAM the government's participation in water control represents another aspect of a hydra-headed federal monster that—NAM contends—is increasingly usurping local and states' rights.

While NAM fears that "conflicting federal, state and private claims to water resources and their utilization interferes with rapid economic growth," many others obviously view progress from the other side of the hill. They believe that the nation's economic growth is assured only if the federal government helps pick up the tabs and only if federal controls are available to resolve conflicting interests of local and state governments, and to pull into line uncooperative industries.

But the program is now under way. Only recourse for die-hard opponents is to use all legally passable stratagems to slow down the advance of federal authority into state affairs; local officials already privately admit that deliberate paper-shuffling and other time-worn but still effective delaying tactics are being employed.

Clarification Needed: The federal government's newly strengthened pollution-control laws will bite deeply; meanwhile, state and local authorities are putting sharper teeth into their laws. But policy differences between regional boards often create vexing problems.

For example, failure to spell out clearly and consistently pollution-control requirements for new industries shunts site-hunting companies to other areas. On the other hand, pollution boards—too lax in their waste disposal policies—invite charges of preferential treatment by more strictly controlled competing industries. Short-cuts in pollution abatement may, in fact, backfire on the favored firms; subsequent code revisions by higher authorities may ultimately call for expensive alterations.

A pulp mill controversy in California is a case in point. Two companies—Georgia Pacific and Simpson—have run into trouble in planning two new pulp mills for Humboldt Bay in northern California. The firms have obtained full sanction of the local pollution-control board to discharge 30 million gal./day of plant effluent directly into the surf.

Opposition to the board-approved plan comes from several quarters: the town of Eureka, five miles away, fears it will be plagued by offensive odors; the important salmon and oyster industry fears irreparable damage to marine life; the Fish and Game Agency contends that the same degree of effluent treatment should be demanded of these mills as is required in other parts of the state.

But the local pollution board, apparently deaf to charges of unfair competitive advantage and assertions that the plan violates intent of the law, is going along with company views rather than risk losing the business to another community with lax pollution-control policies.

In California, at least, this situation will change because a state board will soon regulate the regional boards to establish more consistent treatment of all pollution problems.

A different tack was taken by Kimberly-Clark, which is putting up a new pulp mill at Anderson, Calif. The firm has been in contact with all state pollution-control agencies for a long time, and has submitted complete technical reports on proposed pollution control to the Central Valley Regional Board in California (this was

Current Status of Federal Saline

PROCESS	SIZE	LOCATION
Long-tube vertical multiple-effect distillation	1 million gal./day sea water	Freeport, Tex.
Multistage flash distillation	1 million gal./day sea water	Point Loma, San Diego, Calif.
Electrodialysis	250,000 gal./day; 1,800 ppm. brackish water	Webster, S.D.
Forced circulation vapor compression	1 million gal./day brackish water	Roswell, N.M.
Freezing	150,000-350,000 gal./day sea water	Wrightsville Beach, N.C.

Suppliers of Saline Water Conversion Units

Distillation equipment:
Cleaver Brooks Co., Milwaukee, Wis.
Badger Manufacturing Co., Cambridge, Mass.
Griscom-Russell Co., Massillon, Ohio
Bethlehem Steel Co., Shipbuilding Div., New York, N. Y.
Weir-Chicago (G.&j. Weir Co.) New York, N. Y.
Richardsons, Westgarth & Co., Ltd., Engineering Div., Northumberland, England
Westinghouse Electric Corp., Steam Division, Philadelphia, Pa.
Maxim Evaporator Div., American Machine & Foundry Co., Waterford, Conn.
Aquastills, Inc., Rochester, N. Y.
Mechanical Equipment Co., New Orleans, La.

Electrodialysis Equipment:
American Machine & Foundry Co., Springdale, Conn.
The Permutit Co., New York, N. Y.
Ionics, Inc., Cambridge, Mass.
Cleaver Brooks Co., Milwaukee, Wis.
National Aluminate Corp., Chicago, Ill. (membranes)

Conversion Demonstration Plant Projects

PLANT COST	ARCHITECT AND ENGINEERING CONTRACT	CONSTRUCTION CONTRACT	DUE ONSTREAM	Est. OPERATING COST/1,000 GALS. WATER OUTPUT			
				INVESTMENT COST	OPERATOR'S FEE	DIRECT OPERATING COST	TOTAL
$1.35 million	W. L. Badger and Associates $112,000	Chicago Bridge & Iron Co. $1,246,250	In operation	27¢	8¢	90¢	$1.25
$1.7 million	Fluor Corp. $102,000	Westinghouse Electric Corp. $1,608,000	Nov. 3, '61	27¢	8¢	90¢	$1.25
$482,000	Bureau of Reclamation	Asahi Chemical Industries Co. $482,200	Nov. 9, '61	34¢	7¢	57¢	98¢
—	Catalytic Construction Co. $96,700	—	—	40¢	8¢	77¢	$1.25
—	The Lummus Co. $99,800	—	(15,000-gal./day pilot-plant now operating)	—	—	—	—

Private Firms Doing Saline Water Conversion Research (partial list)

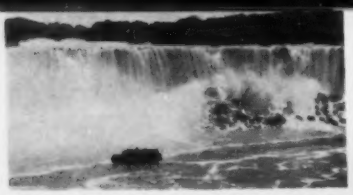
Chance Vought Aircraft, Inc., Dallas, Tex.
The Electric Storage Battery Co., Yardley, Pa.
W. R. Grace & Co., Washington Research Center, Clarksville, Md.
Koppers Co., Inc., Pittsburgh, Pa.
Monsanto Chemical Co., Everett Station, Boston, Mass.
Petroleum Technologists, Inc., Dallas, Tex.
Radiation Applications, Inc., New York, N. Y.
Resources Research, Inc., Washington, D.C.
Southern Research Institute, Birmingham, Ala.
Southwest Research Institute, San Antonio, Tex.
Texas Research Associates, Austin, Tex.
W. L. Badger Associates, Ann Arbor, Mich.
Battelle Memorial Institute, Columbus, Ohio
Bjorksten Research Labs, Inc., Madison, Wis.
Blaw-Knox Co., Pittsburgh, Pa.
Carrier Corp., Syracuse, N. Y.
Curtiss-Wright Corp., Princeton, N. J.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Dow Chemical Co., Freeport, Tex.
H. K. Ferguson Co., New York, N. Y.
The Fluor Corp., Whittier, Calif.
Food Machinery & Chemical Corp., San Jose, Calif.
The Franklin Institute, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Griscom-Russell Co., Massillon, Ohio
The M. W. Kellogg Co., New York, N. Y.
The Lummus Co., New York, N. Y.
Struthers Wells Corp., New York, N. Y.
Scientific Design Co., Inc., New York, N. Y.
The Whiting Corp., Harvey, Ill.
Austin Co., Detroit Mich.
Catalytic Construction Co., Philadelphia, Pa.
Chicago Bridge & Iron Co., Philadelphia, Pa.
Westinghouse Electric Corp., Lester, Pa., and Washington, D.C.

a procedural, not a legally mandatory, requirement).

The board coordinated participation of such agencies as Fish and Game, Health and Water Resources, which made suggestions and established dischargeable waste limits. Result: K-C has minimized future waste disposal problems, kept outside interests satisfied, has obtained help of competent people in the agencies, and has probably saved considerable amounts of money.

Northwest Showdown: Washington state pulp mills and the Washington Pollution Control Commission appear to be headed for a showdown; nine out of 10 mills handed cleanup orders last year recently requested hearings to seek revision of the directives.

Mills asking for the hearings: Scott Paper, Weyerhaeuser and Simpson-Lee Paper, all at Everett; Rayonier, and Fibreboard Paper Products at Port Angeles; Puget Sound Pulp & Timber; Coos Bay Pulp Corp. (subsidiary of Scott Paper) at Anacortes; Boise Cascade Kraft, Wallula; and the Inland Empire Paper Co., Millwood. Crown Zellerbach, Port Angeles, is the only mill with a cleanup order that did not ask for a hearing. CZ plans to spend $4.3 million on pollution control and research in the next five years, compared with $2.91 million spent in the past five years. Puget Sound Pulp & Timber is also spending heavily—$3.5 million in the past five years, probably $3 million in the next five (*chart, p. 76*). Other



firms in the area are spending smaller amounts (two about $100,000 each in the past five years)—except for Inland Empire Paper, which is noncommital about its expenditures probably because spending has been modest at best.

The Northwest Pulp & Paper Assn. estimates that the mills involved in the controversy (apparently not including Crown Zellerbach) spent well over $6 million in the past five years for pollution control and research. (Twenty-nine pulp and paper mills in Wisconsin spent over $3 million on pollution research and nearly $9.3 million for equipment in the past five years.)

Figures concerning pollution control expenditures in the pulp and paper industry are open to interpretation; many improvements of the pulping process reduce the amount of pollution. Improvement costs may subsequently be included (at least partly) in lists of expenditures for pollution control.

Lawson Turcotte, president of NP&P and of Puget Sound Pulp & Timber Co., accuses the pollution commission of submitting the industry to more "arbitrary, costly and confiscatory requirements" than exist anywhere in the world. Setting up the demanded facilities, says Turcotte, would cost more than $100 million. Regional observers guess that if the commission isn't too rough, the companies will probably spend about as much in the next five years as in the past five to control pollution; at least one mill hints it may close down operations if the commission gets too rough.

The state's 10 mills are now operating under temporary waste-discharge permits that stipulate that the mills must install adequate waste-removal facilities by Nov. 24, '63; these must be designed to remove at least 85% of the waste solids now being dumped into Washington waters by the mills.

NPPA contends that the commission has ignored "a legislative mandate to define water pollution" and instead has placed on the industry burden of proof of pollution.

The pulp industry will hammer hard on several crucial —and still largely nebulous—aspects of pollution control. What, for example, is a meaningful definition of "pollution?" What constitutes proper proof of excess pollution? On whom does the burden of proof rest?

And the industry will argue that the same degree of water purity need not be maintained in all localities—hence, blanket orders are likely to be "arbitrary and capricious."

The beleaguered pulp and paper industry is also certain to marshal all possible evidence of its past progress in pollution control. For example, the National Council for Stream Improvement (of the pulp, paper and paperboard industries) says that in the period 1943-59 annual U.S. output of paper and paperboard soared from 17 million tons/year to 34 million tons—a 100% increase. Total waste load, it's claimed, was simultaneously reduced 2% (i.e., the waste load from the average ton of paper and paperboard has been reduced 51% since '43).

These familiar statistics obviously have not swayed the Washington state commission very much; it will press for far greater controls than exist now. Developments in the forthcoming hassle will be significant to the CPI as a whole; it should do much to firm pollution ground rules and may well reveal the degree of pollution control that will ultimately be demanded of many other industries.

Fish and Game: Wildlife agencies are often criticized by industry for overemotional, unrealistic appraisals of waste disposal hazards. But the California Fish and

Pollutants:

Pollutant (type)	Nature of Pollutant
Sewage and other oxygen-demanding wastes	Putrescible organics; normally reduced to stable compounds by aerobic bacteria (which require water-dissolved oxygen).
Infectious agents	Disease-causing organisms (bacteria, viruses).
Plant nutrients	Principally nitrogen and phosphorus compounds.
Organic chemicals	Detergents, pesticides, many industrial by-products.
Minerals and inorganic chemicals	Common salt; acids; metallic salts; cyanides; etc.
Sediments	Primarily soils and minerals; also some industrial by-products.
Radioactive materials	
Heat	Heated water returned to streams and lakes.

Common Types and Sources

Common Sources	Overpollution Results In:	How Measured, Controlled, etc.
Domestic sewage; food processing industries.	Excessive depletion of oxygen in water damages fish life; complete oxygen removal causes anaerobic bacterial action on pollutants resulting in bad colors, offensive odors.	Measureable in terms of biochemical oxygen demand (BOD); i.e. amount of water-dissolved oxygen used in aerobic bacterial decomposition of the waste. Sometimes expressed in terms of population equivalent (PE); includes oxygen demand by industrial waste as well as municipal sewage. Based on average oxygen need of 0.17 lbs./person to stabilize daily sewage and related wastes.
Human and animal wastes; certain industries (e.g. tanning, slaughtering).	Need for stringent purification treatment to obtain potable supplies; losses to fishing industry (especially shellfish); curtailed recreational uses of streams, lakes, etc.	Most commonly controlled with chlorine; all bacterial and viral contamination probably impossible to remove in most cases, but concentrations are greatly reduced.
Municipal sewage; industrial wastes; farms (chemical fertilizers).	Excessive growth of aquatic plant life leading to secondary oxygen-demanding pollution, offensive odors, bad taste.	Serious problem; not removed by ordinary sewage treatment methods.
Domestic and industrial sewage; farms (pesticides, etc.).	Threat to fish and other wildlife; possible long-term ingestion hazards to human beings.	Very often not removed by usual sewage or water purification treatments.
Mining; industrial processes; natural deposits (e.g. salt).	Interference with manufacturing processes; obvious or insidious toxic effects on humans and wildlife; bad odors and tastes; corrosion of equipment (industrial, navigational, power plants).	Difficult to detect and measure; removal often costly.
Land erosion by storms, flood waters, etc.; pulp mill and other plant effluents.	Obstruction or filling of streams, lakes, reservoirs, navigational channels; increases cost of water purification; interferes with manufacturing processes; causes equipment corrosion; reduces fish life.	Controlled by use of soil conservation and flood control methods; also by improvement of industrial technology.
Mining operations; refining of uranium and thorium; power reactors; medical and research centers.	Health hazards to all animal life; small amounts may be concentrated by aquatic life and sediments to increase long-term hazards.	Detectable by automatic stream monitoring; controlled by proper storage of wastes. Future disposal problems will become critical. Normal water treatment methods are ineffective for removal.
Steam-electric power plants; steel mills; refineries; other industrial cooling units.	Reduction of water-contained oxygen, resulting in slower or incomplete pollutant decomposition and damage to aquatic life.	Minimized by recirculation and re-use of industrial cooling waters; choice of proper plant location; use of spray ponds, cooling towers, etc.

Game Agency is winning the applause of industry for its cooperative views on control planning.

On one point Fish and Game makes no concession—no one has the "right" to pollute water resources. But to the agency this does not mean that streams cannot be used for properly controlled waste disposal.

Case in point: Diamond National, a paperboard producer at Red Bluff, Calif., treats effluents from a mild sulfite process before passing it into ponds. But the ponds were recently in danger of spilling over into the Sacramento River; hence, a regional pollution-control board insisted the waste be distributed into the river on an even basis over several miles of stream frontage—a potentially expensive project.

Fish and Game stepped in, said the waste load was minor and probably would not hurt stream life, then initiated a one-point test dumping experiment; no adverse effects were noted on aquatic life and the firm was not

CW SPECIAL REPORT **water**

required by the agency to install unnecessary equipment.

New Jersey Probe: A few weeks ago the U.S. Public Health Service called representatives of the states of New York and New Jersey and the area's Interstate Sanitation Commission into conference. Purpose: to probe alleged pollution in Raritan Bay and related waterways in the New York-New Jersey harbor area. Of primary concern are Raritan Bay, Arthur Kill (a narrow channel separating New York's Staten Island from the New Jersey shore), and the Raritan River (also highly industrialized —especially with CPI plants).

The conference was sparked by the U.S. Surgeon General and constitutes the usual first step in enforcement procedures under the Federal Water Pollution Control Act.

The Raritan Bay case is important for four reasons:

(1) It affects the largest population so far involved in any federal antipollution case.

(2) Waste disposal practices of a large number of chemical plants located in the area (mostly in New Jersey) will come under close scrutiny during the next 12 months, in which time a second conference will be called.

(3) It demonstrates the not uncommon opposition of state officials to federal intervention in local pollution problems even if—as seems fairly clear in the Raritan case—federal jurisdiction is mandatory.

(4) It demonstrates that the degree and nature of pollution in important water areas are still poorly understood, poorly controlled, or at least poorly publicized.

Invasion of Privacy? New York and New Jersey state representatives testifying at the conference strongly questioned the need for federal antipollution action (including calling of the conference) and claimed that pollution abatement is being pursued diligently by both states.

For the record they carefully expressed willingness to cooperate with the Public Health Service, but did not hide their distaste for elaborate joint projects—especially under federal control.

But PHS was not to be shunted into a secondary advisory role; Chairman Murray Stein, chief of enforcement activities of PHS's water pollution-control program, emphasized repeatedly that the PHS action was a statutory requirement, dictated originally by Congress, and was not spurred by any innate desire of the agency to meddle indiscriminately in local affairs.

Grudgingly bowing to the inevitable, the state representatives agreed to investigate Raritan pollution, in preparation for a second hearing; there was unanimous, albeit reluctant, agreement that Raritan Bay and related waters are in fact polluted.

PHS's documentation in support of its action was drawn from material supplied by local health agencies and the Interstate Sanitation Commission. But there were some types of vital information PHS did not find.

The only information available on industrial wastes in the area, said PHS, is a list of 18 plants that discharge effluent into Arthur Kill, and an estimate that the combined wastes from all plants discharging directly into the Kill has a biochemical oxygen demand (BOD) of 100,000 lbs./day or a population equivalent of about 600,000.

Chairman William Cope of the Interstate Sanitation Commission confirmed the dumping by saying that "the nearest industrial waste to the Raritan Bay area that does not receive treatment is along the Arthur Kill where there is an estimated 100,000 lbs. of BOD discharged daily. The domestic (nonmanufacturing) waste from these industrial installations is intercepted and sent to existing treatment plants. So this is strictly industrial and is not a source of diseases from bacteria or virus."

Debate during the conference centered largely on local cases of infectious hepatitis, which have, in part, been attributed to infected clams taken from certain areas of Raritan Bay. Industrial pollution problems were largely glossed over.

But emphasis could shift in the next 12 months or so. Tacit warning to the CPI came in an out-of-conference comment by a state health official who observed that "there are complaints that clams taken from the area have a chemical taste—and you don't have to look far to see where this contaminant is coming from."

The warning is especially significant because it comes from a state official who publicly bemoans federal interference in the area and who privately explains why waste treatment data was "unavailable" to PHS: " We know the area's waste problem, but why should we give them [PHS] ammunition?"

Municipal Systems Buffer Some Plants: Some companies in the area—dispose of their wastes through municipal systems or other established authorities, thereby avoid danger of direct conflict with federal agencies.

For example, an estimated 39.52 million gal./day of wastes are handled now by the Middlesex Authority, in New Jersey (which collects sewage and industrial wastes, works to eliminate pollution of the Raritan and South rivers and their tributaries, and treats these prior to disposal into Raritan Bay).

Of the total flow, these amounts come from individual firms (million gal./day): Union Carbide Plastics, 0.46; Benzol Products, 0.28; Heyden Newport, 0.66; Anheuser-Busch, 0.33; Peter J. Schweitzer, 4.40; Hercules Powder, 1.53; National Lead, 0.48; Catalin Corp. of America, 0.08.

But firms that dump waste directly into interstate waters (Arthur Kill, for example) are accountable to federal as well as local agencies. Right now PHS appears to be leveling its guns at New York and New Jersey plants — predominantly CPI — which "discharge wastes into Arthur Kill." Named by PHS: Phelps Dodge Copper Products; Archer-Daniels-Midland; Cities Service Oil; National Lead; Koppers Co. (Wood Preserving Division); Vulcan Detinning Co.; Westvaco Mineral Products Division of FMC; General American Tank Storage Terminals; American Cyanamid; General Aniline & Film; Du Pont; Esso Bayway Refinery; California Oil. And on the New York side of the Kill: Nassau Smelting and Refining; Socony Mobil Oil; Gulf Oil; Onyx Chemical.

Local Agencies Spike Federal Guns: Local authorities will rely mainly on two basic concepts to thwart the PHS contention that Arthur Kill is a significant contributor of pollution to Raritan Bay: they will argue (1) that Arthur Kill is a Class B area (suitable only for waste disposal and navigation); and (2) that most of the flow from Arthur Kill is northward into Newark Bay not southward into Raritan Bay—hence not a factor in the federal case. Another point of view: Arthur Kill waters are virtually static and that a "slug of pollution" over six miles long stays put.

To resolve these controversies will take time—perhaps enough to permit local agencies and industries to solve their major waste disposal problems before federal action is taken.

Pollution Control Cost: *CW*'s just-completed nationwide survey of the chemical industry (*chart, p. 76*) provides a hint of the mounting expenses of pollution control to most companies. The data obtained is insufficient to measure total national CPI expenditures, mainly because about 70% of firms queried would not reveal figures. Reasons varied: some feared they might be committed to spending that would later be found unwarranted; some had trouble extracting pollution-control costs from other operational expenditures; some no doubt are in no position to boast about their accomplishments.

Nonetheless the large number of prompt returns underscore the industry's concern about pollution control. What do the answers show? Amounts spent in the past five years ranged from zero in some cases to more than $10 million; top estimate for an individual company for the next five years was $12 million. The pollution budget is obviously not directly relatable to company size—although larger firms generally have the biggest expenses. Product type, geographic locality, and many other factors govern complexity of waste disposal problems. Degree of enforcement generally determines how much is done.

Virtually all firms are spending money primarily on control of plant effluents; only a few face problems of cleaning up water before it's used for manufacturing.

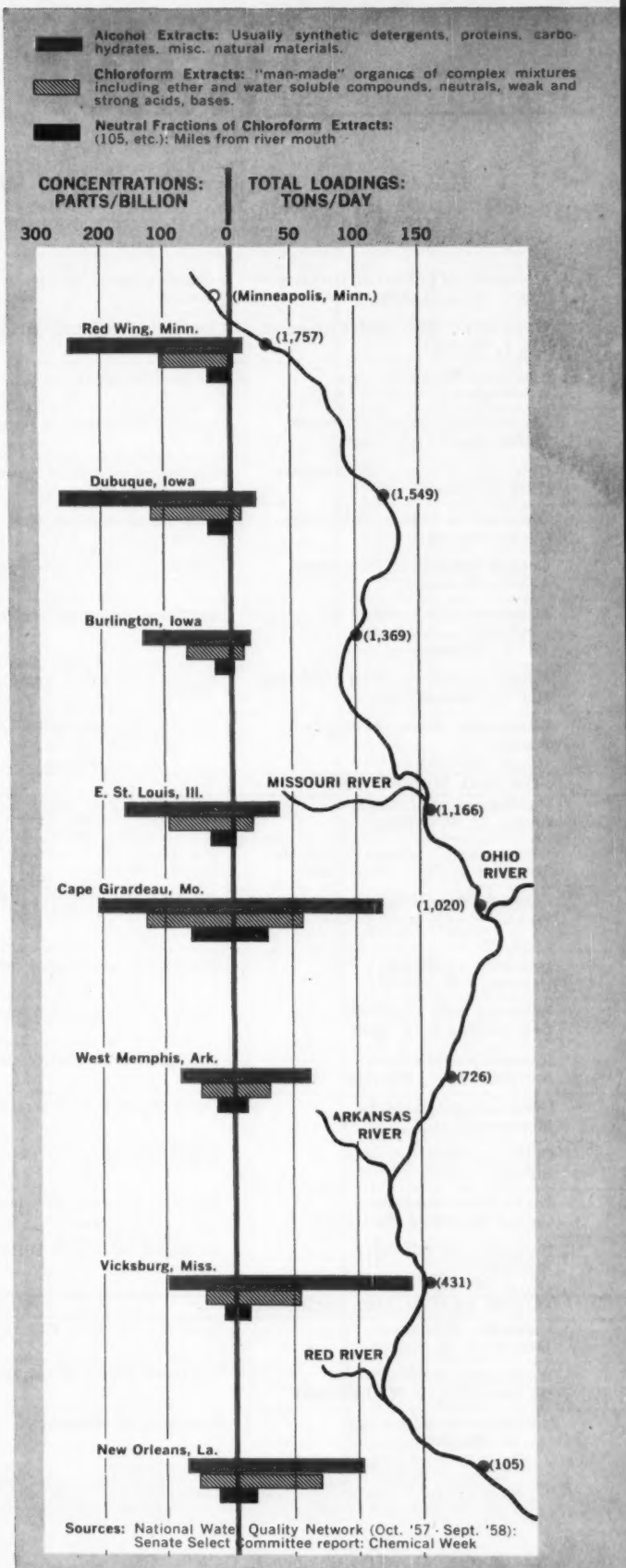
Both organic and inorganic waste products pose problems, but prime emphasis is on control of organics; none of the companies queried are significantly concerned about radioactive pollutants.

CPI Rates High in Michigan: A report by the Michigan Water Resources Commission provides another noteworthy—albeit regional—indication of what the chemical industry is doing about pollution.

The commission rated 449 manufacturing plants (400 companies) on their control practices, using seven classifications ranging from A (control adequate) to G (no control). The CPI accounted for about 20% of the total plants; slightly more than half of this group were pulp and paper facilities.

Bulk of the total industry ratings fell into three classes: 278 into Class A, 92 into Class B (control provided—adequacy undetermined) and 42 into Class F (existing control inadequate or incomplete).

Mississippi River Organic Chemicals Pollution



CW SPECIAL REPORT **water**

Government Grants: Research in Water Supply and Pollution Control*

Grant Recipient	Research Program	Size of Grant
University of California, Berkeley, (John W. Johnson)	Oceanographic factors in the functional design of ocean outfall sewers	$12,000
University of California, Richmond, (W. J. Oswald)	Increasing high-rate pond loading by phase isolation	$12,000
Resources Research, Inc. Washington, D.C. (G. V. Levin)	Harvesting algae	$15,370
Florida State Board of Health, Winter Haven (J. L. Yount)	Causes and relief of hypereutrophication of lakes	$35,257
University of Miami, Coral Gables (F. G. W. Smith)	Ecological effects of sewage in Biscayne Bay	$ 9,430 $ 2,208
University of Florida, Gainesville (J. B. Lackey)	The sulfur relationships of micro-organisms	$18,828
Georgia Institute of Technology, Atlanta (W. Grune)	Determination of low-level radioactivity in water	$15,945
Massachusetts Institute of Technology, Cambridge (P. L. McCarty)	Microbiology of anaerobic digestion	$14,950
Rutgers University, New Brunswick, N.J. (H. Heukelekian)	Removal of some organic pesticides and herbicides from water	$ 5,980
Washington State University Pullman (R. A. Phillips)	Sphaerotilus control for irrigation water	$12,325
FISH AND AQUATIC LIFE		
Humboldt State College, Arcata, (J. W. DeWitt)	Improvement of oxidation pond effluents by fish-food organisms and fish	$15,000
University of Southern California, Los Angeles (R. E. Stevenson)	The study of benthonic foraminifera and their relationship to ocean pollution	$19,967
Colorado State University, Fort Collins (S. M. Morrison)	The role of animal fecal flora in stream pollution	$ 2,032 $12,650 $ 2,276
University of Illinois, Urbana (R. S. Wolfe)	The higher bacteria of polluted streams	$10,350
Michigan State University, East Lansing (R. C. Ball)	Study of fundamental productivity in a stream	$ 9,924 $ 2,246
University of Michigan Ann Arbor (C. F. Powers)	Ecology—water quality changes in Lakes Michigan and Erie	$56,328
University of Minnesota, Minneapolis (L. L. Smith)	Effect of paper fiber waste on fish eggs and juveniles	$46,565
Oklahoma State University, Stillwater (W. H. Irwin)	Resistance of fish to refinery effluents	$27,638
Texas A&M Foundation, College Station (A. W. Collier)	Assay and survey of insecticides in marine environment	$32,883
University of Wisconsin Madison (R. J. Dicke)	Biological factors in the management of lake flies	$20,945
HUMAN HEALTH AND RECREATION		
University of Colorado, Denver (S. G. Stuart)	Enteric pathogens and viruses in irrigation water	$23,000
Washington University, St. Louis, Mo. (D. W. Ryckman)	Characterization of extracts from the Missouri River	$23,849
University of Pittsburgh (M. A. Shapiro)	Physiological aspects of water quality	$32,347

*Dept. of Health, Education, and Welfare; Public Health Service. There are 142 grants in all; 71 in pollution control methods and treatment ($958,218); 62 in fish and aquatic life ($994,000); and 9 in human health and recreation ($164,586). Total grants amount to $2,116,804.

Ratings of pulp and paper plants: about 34% were rated A or substantially below the total industry rating of 62%; 30% were rated B, compared with 20% for all industry; 23% were rated F or much higher than the 8.7% for industry as a whole. At the time the study was made ('59) there was obviously considerable room for improvement in pulp and paper pollution control in this area.

CPI plants not including pulp and paper scored much higher: 61% were in Class A (almost identical to total industry); 27% were rated B (much better than for total industry) and 7% were rated F (slightly less than all plants).

The CPI apparently was keeping up with the Jones's in pollution control insofar as the survey results revealed. But it should be noted that had Class B been more specific (adequacy was undetermined) final results might have looked somewhat different. Moreover, in the past two years substantial improvements have undoubtedly been made, so presumably the total picture is now improved.

What About Radioactivity?

Disposal of radioactive wastes poses a tricky and worrisome problem; some experts suggest that waste disposal could become the most significant factor limiting development and use of atomic energy on a broad scale.

Few realize radioactive wastes are now being passed into the nation's rivers—at carefully controlled rates. The fact is that these disposed radioactive wastes now reach many supplies of drinking water.

For example, more than 14.9 million gal. of liquid containing radioactive wastes were handled at the Dresden Nuclear Power Station near Chicago between April '60 and Aug. '61. These liquids were either demineralized and reused in the plant or were discharged at a controlled rate into the Illinois River.

Rate of discharge into the Illinois is controlled to a level below 100 micromicrocuries/liter of unidentified radioactivity. The plant usually limits addition to river water to 10 micromicrocuries/liter—and only rarely will add as much as 50 micromicrocuries/liter during discharge of a batch. Cost of this rate of discharge during plant operation is about 5¢/1,000 gal. But when the plant is not in operation and circulating pumps for dilution of waste must be run, the discharge rate becomes $35/1,000 gal.

The Duquesne Light Co.'s pressurized-water-reactor power plant at Shippingport, Pa., uses several waste disposal processes—e.g., natural decay of radioactive materials, ion exchange, dilution in turbine condenser effluent stream, separation of radioactive materials by evaporation, storage in underground tanks, incineration, packing for land burial.

Under agreement with the Commonwealth of Pennsylvania, a maximum of 6,200 microcuries/day and an annual average of 1,590 microcuries/day of radioactive materials may be discharged into the Ohio River. A maximum of slightly over 10,000 microcuries were discharged into the river in Oct. '60.

Government Contracts: Advanced Waste Treatment Research Projects*

Contractor	Project
Louis Koenig San Antonio, Tex.	Development of technical specifications for treatment processes Analysis of permanent disposal of concentrated residue Wet combustion—feasibility as method of ultimate disposal
A. J. Barduhn Syracuse University	Analysis of freezing and hydration processes
J. A. Gerster University of Delaware	Analysis of distillation processes
D. F. Othmer Polytechnic Institute of Brooklyn	Analysis of distillation processes Extraction—general feasibility study
W. L. Badger Assoc. Ann Arbor, Mich.	Analysis of distillation processes
K. C. Hickman Rochester, N. Y.	Analysis of distillation processes and run on rotary still
K. Kammermeyer State University of Iowa	Surveillance of applicable technical journals in the German language
Engineering Science, Inc. Arcadia, Calif.	Subtle physiological effects of contaminants on aquatic life
Dow Industrial Service Midland, Mich.	Adsorption on carbon—regeneration by chemical oxidation
H. P. Gregor Polytechnic Institute of Brooklyn	Electrodialysis — membrane separators to promote ion conduction; adsorption — synthetic oil-swelling resins
Radiation Applications, Inc. Long Island City, N.Y.	Foam fractionation—additives to enable removal of nonsurfactants
Harvard University Cambridge, Mass.	Adsorption on carbon, silicates, naturally occurring materials; development of analytical methods of identifying organic contaminants
Applied Science Labs State College, Pennsylvania	Freezing—solid ice is not moved
Ionics, Inc. Cambridge, Mass.	Electrodialysis — high-porosity membranes — supersaturation; ion-exchange—on high-porosity synthetic resins

*Dept. of Health, Education, and Welfare; Public Health Service.

CW SPECIAL REPORT

water

Pollution: How Much the CPI Spends on Control and Research

COMPANY	INVESTMENT: Past 5 years (thousands of dollars)			INVESTMENT: Est. next 5 years (thousands of dollars)			Most troublesome effluent pollutants (*)		
	Control	Research	Total	Control	Research	Total	Organics	Inorganics	Other
Alabama metallurgical	0	0	0	0	0	0	—	—	
American Cyanamid	8,250	1,250	9,500	3,750	2,000	5,750	X	X	
Ansul Chemical (Chemical Division)	5	5	10	25	40	65	X	—	Arsenicals
Apache Powder	0	0	0	0	0	0	—	—	
Atlantic Refining (Philadelphia Refinery)	4,450	300	4,750	7,100	250	7,350	X	—	Hydrocarbons
Atlas Chemical Industries	50	10	60	1,000	20	1,020	X	X	
Allied Chemical	"research & development"		1,400	"substantial amounts"			X	—	
Celanese Corp. of America (Celanese Chemical Co.)	300	25	325	400	50	450	X	—	
Carus Chemical	2	10	12	1	25	26	—	X	
Chemetron Corp. (Chem. Prod. Div.)	150	10	160	137.5	35	172.5	X	X	
Collier Carbon & Chemical	("minor problems")			—	—	—	—	—	
Crown Zellerbach	2,705	205	2,910	4,000	300	4,300	—	—	†
Dow Chemical (Midland Div.)	—	—	9,000	—	—	11,250	X	—	††
Eli Lilly and Co.	1,192	50	1,242	1,350	50	1,400	X	X	Antibiotic wastes
East Texas Pulp and Paper	300	50	350	300	50	300	X	—	
Fibreboard Paper Products	—	—	100	—	—	—	X	—	
Fritzsche Bros.	5	—	5	5-10	—	5-10	X	—	
General Mills (Chemical Div.)	130	5	135	175	10	185	X	—	
Goodrich-Gulf Chemicals	—	—	500	—	—	>1,000	X	X	Suspended solids
Goodyear Tire & Rubber	700	—	700	900	—	900	X	—	
Hercules Powder	2,000	200	2,200	4,000	700	4,700	X	—	
Hoffman-La Roche	20	10	30	200	50	250	X	—	
Hooker Chemical Corp.	1,500	250	1,750	2,000	250	2,250	X	X	
Interchemical Corp.	200	—	200	250	—	250	—	X	
Kimberly-Clark	—	350	—	—	350	—	X	—	
Merck & Co. (Chemical Div.)	1,900	200	2,100	700	200	900	X	—	
Michigan Chemical	—	2	2	17	3	20	—	X	
Miles Chemical (Zeeland plant)	50	5	55	30	10	40	X	—	
Monsanto Chemical	5,000	500	5,500	10,000	1,000	11,000	X	—	
National Gypsum (Paper Mfg. Division)	240	—	240	200	—	200	X	X	
Oakite Products	"not a major problem"			—	—	—	—	—	
Phillips Chem. Co.	925	50	975	—	—	—	X	X	
Petro-Tex Chemical	12	5	17	10	5	15	—	X	
Pittsburgh Coke & Chemical	700	250	950	600	400	1,000	X	—	
Pittsburgh Plate Glass	not separable from other expenses						—	X	
Puget Sound Pulp and Timber	—	—	3,500	—	—	3,000	X		
Quaker Oats Co. (Chemical Div.)	250	75	325	300	0	300	X	—	
Rayonier, Inc.	10,000	200	10,200	—	—	—	X	X	
Rhinelander Paper	315	140	455	2,400	200	2,600	—	X	
Sandoz, Inc.	"no problem"		—	—	—	—	—	—	
Charmin Paper	220	164	384	1,400	289	1,689	X	—	Sugars, Lignins
Simpson-Lee Paper	—	—	100	—	—	—	X	—	
Stauffer Chemical	—	—	300	—	—	—	—	X	
Texas-U.S. Chemical	0	0	0	?	?	?	X	X	
Toms River Chemical	2,000	50	2,050	1,500	100	1,600	X	—	
Vitro Chemical	—	25	25	?	?	?	—	X	
Wyandotte Chemicals	1,000	250	1,250	1,250	350	1,600	—	—	

Almost all of these expenditures are for plant effluent control; in few cases for cleanup of water supplies before use. Source: CW survey.

† Fiber and Waste Pulping Liquors †† Includes expenditures for air-pollution control. Additional $3 million spent on capital investments.

Vinyl Coating for Aluminum Siding

Needs

CARBIDE'S Full Range of Ketones

What are your coating end-uses . . . aluminum siding . . . container coatings . . . strippable coatings? What is the method of application?

Whatever the combination may be, CARBIDE is ready as a single source of supply, with a full range of ketones including these high-purity products of uniform quality:

Acetone—the fastest-evaporating vinyl solvent.

Methyl Ethyl Ketone—with broad applications in vinyl solution coatings.

Methyl Isobutyl Ketone—for low-viscosity vinyl resin solutions.

Methyl Isoamyl Ketone—new slow-evaporating vinyl solvent with unusual solvent power.

Isophorone—standby for baked vinyl solution coatings; slowest evaporating of the line.

The table below lists viscosities measured on a Brookfield viscometer at 20 R.P.M. and 68°F., and relative evaporation rates (n-Butyl Acetate = 100) for these five ketones:

	Brookfield Viscosities of Lacquers at 68° F. (centipoises)		Relative Evaporation Rate
	Formula A	**Formula B**	
Acetone	94	88	1160
Methyl Ethyl Ketone	86	130	572
Methyl Isobutyl Ketone	230	360	165
Methyl Isoamyl Ketone	304	504	45
Isophorone	930	434	3

Formulas (Parts by weight)

	A	B
BAKELITE Vinyl Resin VYHH	20	20
Ketone	80	40
Xylene	—	20
Toluene	—	20
Total	100	100

For complete information on ketones or other solvents, including esters, alcohols, and glycol-ethers, call your CARBIDE Technical Representative, or write: Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y.

BAKELITE and UNION CARBIDE are registered trade marks.

UNION CARBIDE CHEMICALS

CW SPECIAL REPORT **water**

At the Plutonium Recycle Test Reactor (PRTR) at Hanford Laboratories, Richland, Wash., concentration limits of radioactive wastes discharged into the Columbia River are based on "conservative considerations between the waste monitoring station and the first downstream use of Columbia River Water as a source of sanitary drinking water supply for Pasco, Wash., a few miles downstream." Control limit on the principal disposal manhole was set at 5 millicuries/cubic centimeter, well within recommendations of the International Commission on Radiological Protection for a year's dose to the thyroid of persons not occupationally exposed to radiation.

The reactor is shut down periodically when concentration of radioisotopes reaches maximum permissible concentration in drinking water. Contributions of PRTR to the fraction of nonoccupational MPC (maximum permissible concentration) in Pasco water during periods of normal reactor operations are estimated at less than 0.001%.

Automatic Monitoring: The science of stream monitoring, to maintain a constant check on degree and nature of water pollution, is still in its infancy. It is obvious that development of monitoring techniques must be pushed if the nation is to cope successfully with its mounting water pollution problems.

Many states—California for example—have already recognized the need and are writing monitoring requirements into their waste disposal laws.

How is industry reacting to monitoring requirements? Apparently most companies will monitor streams if they are told to do so; if the law spells out requirements clearly enough, compliance is good. But in monitoring—as in actual control practices—severe inequities and confusion arise from widely divergent monitoring requirements imposed by regional pollution boards. It is increasingly evident that some method of equalizing the demands of various regional boards will have to be found.

At the moment, the nation hardly knows what specific wastes should be monitored (aside from the most obviously offensive or toxic materials that are discharged into streams).

There are, of course, some notable monitoring experiments in progress. Of top interest is the Orsanco Robot Monitor, which has been operated by the Ohio River Commission since Sept. '60. The automated system measures hydrogen-ion concentration, chloride ion, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature and solar radiation (radioactivity detectors are being added).

Measurements by the equipment in these modular multiple analyzers (located at strategic points along the river) are transmitted to a control center in Cincinnati through a low frequency multiplex system (transmission is over intercity telegraph line).

At specific intervals the control center automatically "interrogates" each monitor station; the information is fed into a data logger, then put through computer evaluations.

The robot monitor should greatly simplify the water-quality vigil maintained by state agencies; it should be able to quickly detect accidental or negligent pollution, speed corrective action.

Other types of monitoring systems are being developed for specific purposes. For example, General Electric recently set up a new Columbia River monitoring system at the Hanford atomic energy works near Richland, Wash. Instrumentation and recording equipment automatically provide continuous records of radiation in the river. The monitoring station is located near the downstream boundary of the Hanford reservation, and is far enough upstream from the nearest community using water for drinking purposes to permit sufficient time for evaluation and preventive action in the unlikely event that above-limit radiation in the river is detected.

There are other, wholly different types of monitoring methods being developed. For example, along the Sabine River (Texas) Du Pont has been cooperating for years with the Academy of Natural Sciences (Philadelphia) in development of a so-called diatometer technique to measure stream purity. In essence, diatomaceous aquatic microorganisms taken from the river are periodically examined because they are very sensitive to environmental changes; observed changes, correlated with other stream analysis data, reportedly provide a good check on water quality.

The problems involved in developing adequate monitoring methods to detect and control the discarded by-products of an increasingly complex industrial society are virtually endless. But this is only one phase of the total problem of water resources conservation and related waste product disposal.

Considering the magnitude of the total waste disposal problem, the currently estimated $6 million/year spent on pollution research in the nation looks meager. Obviously research allocations will have to be bolstered significantly by both private industry and by government agencies.

Huge voids of scientific knowledge—largely in terms of understanding the basic problems, let alone solving them—need to be filled. The job can be done effectively only if there is cooperation between all involved—industry, government, scientists, social planners right down the scale to the average citizen with one vote to cast on a vital referendum issue.

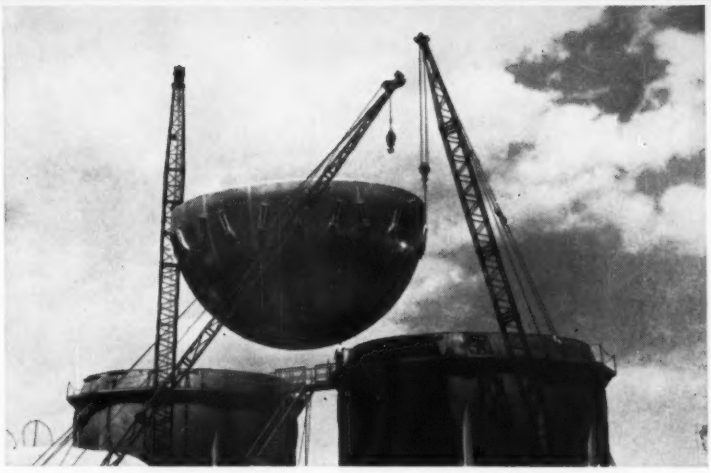
Reprints of this report will be available for $1 each. Bulk rate on request.

FOR LINDE

AT HUNTSVILLE, ALA.

BY PDM STEEL COMPANY

320°F BELOW ZERO STORAGE FOR LIQUIDS IN SPHERES-WITHIN-SPHERES



A hollow ball of aluminum alloy, nested within a carbon steel shell. That's the inside story of these PDM-built cryogenic storage spheres for liquefied gases, using Linde-approved designs. Holding liquid nitrogen at a sharp —320°F, and liquid oxygen at —297°F, the vessels are essential units in the tonnage production of both gases at the new Huntsville, Ala. plant of Linde Company, Division of Union Carbide Corporation. A specially-designed rod support system suspends the 39′ dia. inner spheres within their outer steel shells. Several feet of powdered insulation between the walls slows heat transfer almost to a halt. Structures like these, among the largest of the type ever built, prove PDM's mastery of cryogenic construction techniques, based on many years of application in this field. • We welcome your inquiries, and will be glad to quote on your specific cryogenic storage requirements.

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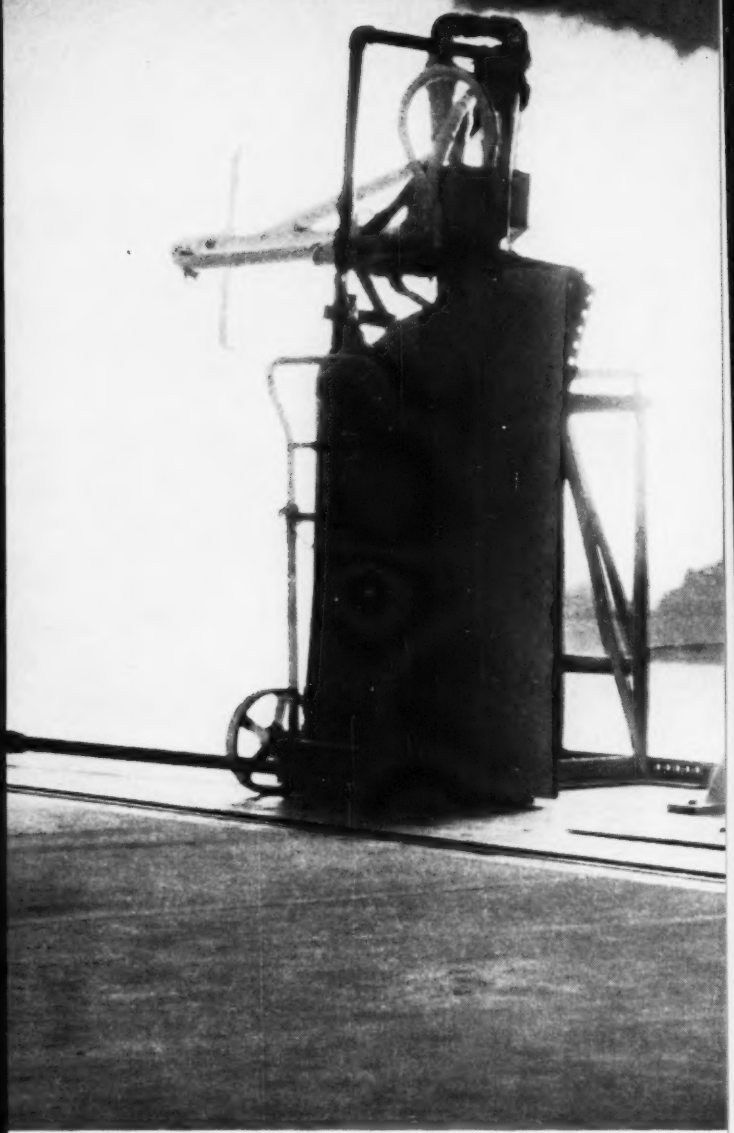
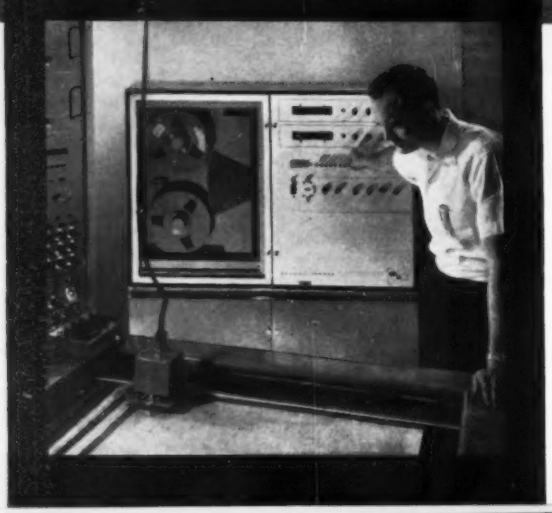
SPACE . . . IMAGINATION . . . ENERGY

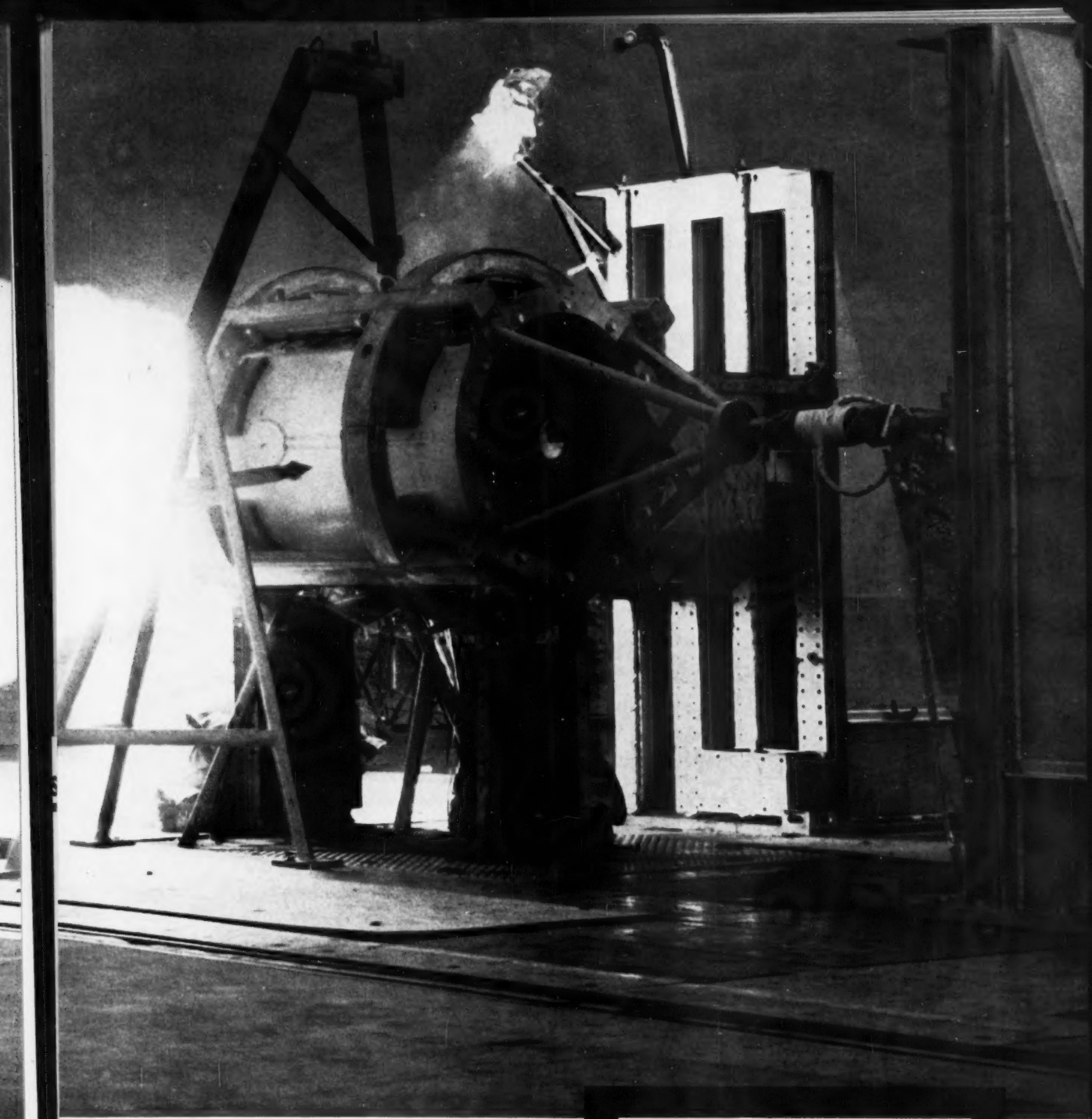
HERE'S HOW WE MEASURE MISSILE MUSCLE





This is one of the test-bays at the Hercules-owned-and-operated plant at Bacchus, Utah. Here the third-stage engine for the Minuteman rocket was developed and is manufactured for the Air Force. The advanced second-stage Polaris engine, developed for the Navy at Allegany Ballistics Laboratory, is also being manufactured here. Hercules' Bacchus plant is a fully integrated facility for research, development, and production line manufacture of high-specific-impulse solid-fueled rocket engines.

As each new design-idea is proved out in roaring flame, a net of cunningly placed transducers take the engine's pulse, its temperatures, check its pressures, stresses and thrusts. This welter of information is fed, at 20,000 bits



per second over 240 separate input channels, to a central data acquisition room where it is permanently recorded on synchronized magnetic tapes. Meanwhile, as many as twelve high-speed cameras exposing up to 3,000 frames a second on a quarter-mile of film, keep a visual record of everything that happens with thousandths-of-a-second accuracy.

Thus, each test of component, propulsion unit, experimental design or completed engine yields a maximum amount of information ready for computer analysis and integration to advance both design criteria and manufacturing methodology. This is just another example of Hercules imagination in propulsion engineering.

Chemical Propulsion Division

HERCULES POWDER COMPANY
INCORPORATED

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XP61-2

FRONTIER CAUSTIC SODA Carries its own umbrella!

Caught in the rain with no tarpaulin . . . but the load is safe! For **FRONTIER** Caustic Soda carries its own umbrella. Its exclusive service-proved 50 and 100-lb. bags are heavily coated with moisture-proof polyethylene, sewn and heat-sealed top and bottom. Inside, a waterproof plastic insert features a valve-type "breather" seal that prevents entrance of moist air . . . keeps the caustic from caking. Not one failure has been reported on this new improved bag in oilfield use — many exposed to rain and snow all winter. Specify Frontier Caustic Soda . . . in the weatherproof bag. Frontier Chemical Company, P. O. Box 545, Wichita 1, Kansas.

FRONTIER CHEMICAL COMPANY

division
VULCAN MATERIALS COMPANY

Technology
Newsletter

CHEMICAL WEEK
October 7, 1961

Large-scale shipments of liquefied methane from Africa to Europe may soon be a reality. Negotiations are believed to have reached the point where an official confirmation of the project should soon be forthcoming. It will involve shipment of liquid equivalent of about 150 million cu.ft./day of gas, will keep two large tankers busy plying the seas between Africa and Great Britain. Negotiations involve a British government group, Conch Methane Services, Ltd. (40% Royal Dutch/Shell, 40% Continental Oil, 20% William Prince interests), and a group of French companies.

The British now operate three gasification plants (two based on coal, one on oil) to make 100 million cu. ft./day of gas. And they are looking at sites for another. However, the product of gasification ("town" gas) from these plants has roughly half the heat content of methane. Some proponents of liquid methane shipments say that, in Great Britain at least, gasification simply won't be able to compete against methane liquefaction.

The product is intended primarily for heating use. But it's worth considering that the scale of liquefaction proposed for Britain would also provide an enormous amount of Btus for refrigeration (when the liquid expands to gas). It's not clear how (or even if) this end-use will be utilized. But it could have a far-reaching effect on industrial cryogenic processing, as in air separation plants.

•

The key step in Olin Mathieson's new glycerin route is the conversion of propylene oxide into allyl alcohol (*see also p. 31*). The classic (Shell) process starts with the hot chlorination of propylene to make allyl chloride, which goes through dichlorhydrins and epichlorhydrin before the final conversion into glycerin.

Union Carbide Chemicals explored the isomerization of propylene oxide into allyl alcohol (British patent 603815; U. S. patent 2,426,-264). The method, which was employed on a large scale by Carbide for a time, involves a vapor-phase reaction at 240-255 C. in the presence of lithium phosphate catalyst. Wyandotte has patented an approach using a nonlithium catalyst (U. S. patent 2,479,632).

Presumably, Olin can convert some of its ethylene oxide capacity (by the chlorhydrin method) to make propylene oxide. The question is How much ethylene oxide capacity can the firm afford to give up? The new SunOlin ethylene oxide plant could free some ethylene oxide capacity. (This plant will make about 55 million lbs./year; half of this is thought to be committed to Rohm & Haas.) In fact, Olin is believed to have already converted one of three chlorhydrin units at Doe Run to production of propylene oxide to meet existing needs. More conversion might leave the firm strapped for ethylene oxide capacity, however.

But Olin's latest moves should give it an added degree of flexibility in making ethylene oxide, propylene oxide, and glycerin, as the market trends dictate.

•

An essentially inorganic membrane for use as an electrolyte in fuel cells, some saline-water conversion projects and other jobs has been developed by The Armour Research Foundation (Chicago). It's being mentioned in a paper this week at the Detroit meeting of the Electrochemical Society.

General Electric has been working on an organic membrane, reportedly has a contract to develop power packs for space gear.

ARF feels it has a "significant improvement" on the idea. It reasons that the GE device is limited to operations of about 70 C, although it undoubtedly can operate at higher temperatures for short periods. Moreover, an organic material might be susceptible to oxidation. Since efficiency of the membrane rises rapidly with higher temperatures, ARF researchers set out to develop a more heat-resistant membrane.

ARF employs a polymer made from zirconyl chloride and phosphoric acid. This is mixed with Teflon fluorocarbon powder, pressed out and coated with layers of the polymer and platinum black, pure platinum black and finally a thin platinum screen. The development is at an early stage, but results so far have been encouraging; ARF thinks the membrane might operate satisfactorily at 150 C, but will settle for a range between 75 and 125 C.

•

To accommodate its new wood preserving process, Koppers is planning a major expansion of its Oroville, Calif., plant. The process, called Cellon, involves treatment of wood with liquefied petroleum gas to drive in the preservatives—e.g., pentachlorophenol. Claims for the new method: the treated product is unchanged in color, weight, size, strength, workability. It resists decay, termites, does not leach or require rekiln drying and can be readily clear-finished or painted.

•

A new low-cost epoxy diluent will be available in commercial quantities this week from Antara Chemicals (division of General Aniline & Film Corp.). The new material, to be trade-named AT-534, marks the entry of Antara into the expoxy resin field.

The product is described as a low cost (45¢/lb.) nontoxic epoxy reactive diluent that effectively reduces the viscosity of liquid epoxies.

The high-boiling, ordorless liquid is said to react readily with epoxy curing agent admixtures without appreciably affecting cure or gel, even at room temperature. The diluent does not react with epoxy resin in the absence of curing agents, permitting long storage life. It reportedly will form adducts with aliphatic polyamine curing agents that are capable of curing epoxy resins at room temperature; and also will solubilize aromatic polyamines, thereby forming compounds readily soluble in epoxies.

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FLEXOWRITER MACHINE is a major part of our improved service. By automatically filling in all shipping data pertinent to each customer's account, this equipment greatly speeds up order-processing and eliminates chance of error.

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FLUIDICS* AT WORK

Pfaudler factory inspector electric-tests **Nucerite** bayonet heater (6⅝" dia. by 68" long) designed for experimental use in high-temperature sulphuric acid environment.

Progress report:

NUCERITE moves into limited production

Now, there is a practical way to cope with a broad range of corrosives in the 500 to 1500°F temperature range.

It's Pfaudler® Nucerite,* a recently developed family of ceramic-metal composites that resist corrosion at these high temperatures.

Various formulations of Nucerite have undergone field testing on a wide scale since this group of materials was introduced last year. Results indicate many practical applications for Nucerite in the 500 to 1500°F range. Very few materials available up till now would withstand these temperatures, and even then only under extremely limited conditions.

Limited production. Where field tests or lab data substantiate the serviceability of Nucerite in a given application, Pfaudler now accepts orders for production equipment of simple shape, rounded corners, and uniform cross section.

Successful tests. You can get some idea of the range of applications for Nucerite from this representative list of successful field tests:

1. Metal halides at 1292°F (a specialty alloy failed in this service in 2 to 3 weeks).
2. Cl_2 and CCl_4 mixture at 600°F (a quarter-inch stainless steel piece corrodes through in a matter of minutes).
3. Refractory metal chlorides at 485°F.
4. Coal tar pitch at 750°F (solid ceramic materials previously used failed here due to thermal shock).
5. Aqua regia plus heavy abrasive at 225°F (tantalum is the only metal which could withstand this condition).
6. HCl plus solids (100 f.p.s.) at 1112°F.

Nucerite equipment. Among the equipment for which orders have already been received, are the following: 6"-diameter pipe, 2½"-diameter boiler tube, 6⅝"-diameter bayonet heater (shown above), 12"- and 18"-diameter columns, finger baffles, and a 300-gallon "RA" series closed-top reactor.

Other characteristics. Nucerite offers the greatest potential in coping with corrosion at high temperatures. However, resistance to impact, abrasion, and rapid temperature change is also of importance for specific applications.

Data available may indicate which formulation of Nucerite can best solve your particular problem. If not, we invite your participation in a field evaluation program.

For more information, write to the address shown on the facing page.

*Patent applied for

Only 10 days from here to your plant

That's the delivery story on selected Pfaudler Glasteel reactors.

In standard sizes and assemblies you can get the reactor you need, shipped to your plant, just 10 days after receipt of your order.

This "off-the-shelf delivery" applies to completely assembled Glasteel reactors in lab, pilot-plant and production sizes. Specifically, it covers the following: "P" series reactors in 30-, 50- and 100-gallon sizes; "E" Series in 200-, 300- and 500-gallon sizes; and "RA" series in 500-, 750-, 1000- and 2000-gallon sizes.

Complete specifications for these reactors are covered in Bulletins 927, 971 and 988, respectively.

Of course, all of these reactors bring you the many desirable features of Glasteel. Long life in corrosive service, since Glasteel is resistant to all acids (except HF) to 350°F and most alkalies at moderate temperatures. An essentially inert product-contact surface that protects purity, quality, and color. And a hard, smooth surface that resists build-up and is easy to clean.

When you need a reactor in a hurry, take advantage of the fast delivery and operational flexibility provided by Pfaudler's pre-stocking program.

In all, you can choose from 29 different standard models of Glasteel reactors, ranging in size from 1 to 4000 gallons. Normal delivery quoted, except as indicated here.

Write for free bulletins.

Why have wipers in an evaporator?

You'll find four wipers like this one in the Pfaudler Wiped Film Evaporator.

Their job: Wetting the entire evaporator wall with a *uniform*, thin film.

The result: High thermal efficiency and excellent heat transfer when you evaporate products that are heat sensitive, highly viscous, or low in thermal conductivity.

Free-floating, the blades are held in contact with the evaporator wall by centrifugal force. Note the slots—they

prevent curl and help accelerate product movement down and off the wall.

This gives you the best combination of full utilization of heat transfer area, an ultra-thin film for highest "U" values, and very short contact time at elevated temperatures.

The Pfaudler Wiped Film Evaporator is a high-capacity production unit, able to provide you with an evaporation rate of up to 50 lbs/hr/sq ft of heat transfer area, based on water.

Choose from standard models with 4 to 100 sq ft of evaporating area. If you need something larger, we'll fabricate on a custom basis.

Offer: Let us test your product at our Test Center. Or start by evaluating the data and specs in Bulletin 991.

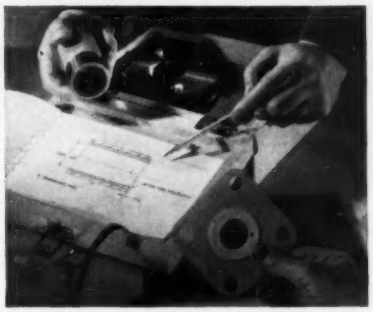
Address all inquiries to our Pfaudler Division, Dept. CW-101, Rochester 3, N. Y. *In Canada, contact Pfaudler Permutit Canada Ltd., Toronto.*

Special gasket assures precise alignment for F-C Glasteel pipe*

This is the high-integrity glass-lined pipe that you can cut, thread, fire-polish and install right in the field. And to make sure that gaskets seat properly when you join sections, we've taken special precautions to assure precise alignment of the pipe axes.

Here's how: Flange bolt holes have been made *only* 1/16" oversize, rather than the conventional 1/8" oversize. In addition, the bolt holes in the gasket itself have also been made *undersize*. The gasket is thereby centered with the axial center line of the pipe and limits non-parallelism of the flanges.

Both the pipe and the gasket joints have been extensively tested — in the field and in our Test Center. For example, intermittent tests over a seven-month period were made with the following acids: 10% sulphuric, 10% nitric, and 20% hydrochloric. Pressures ranged



from 50 to 125 psi, with temperatures from 160 to 300°F. *There were no failures of either the glass lining or the gaskets.* Similar results have been reported for actual installations, including one of 850 feet, in operation since early last summer.

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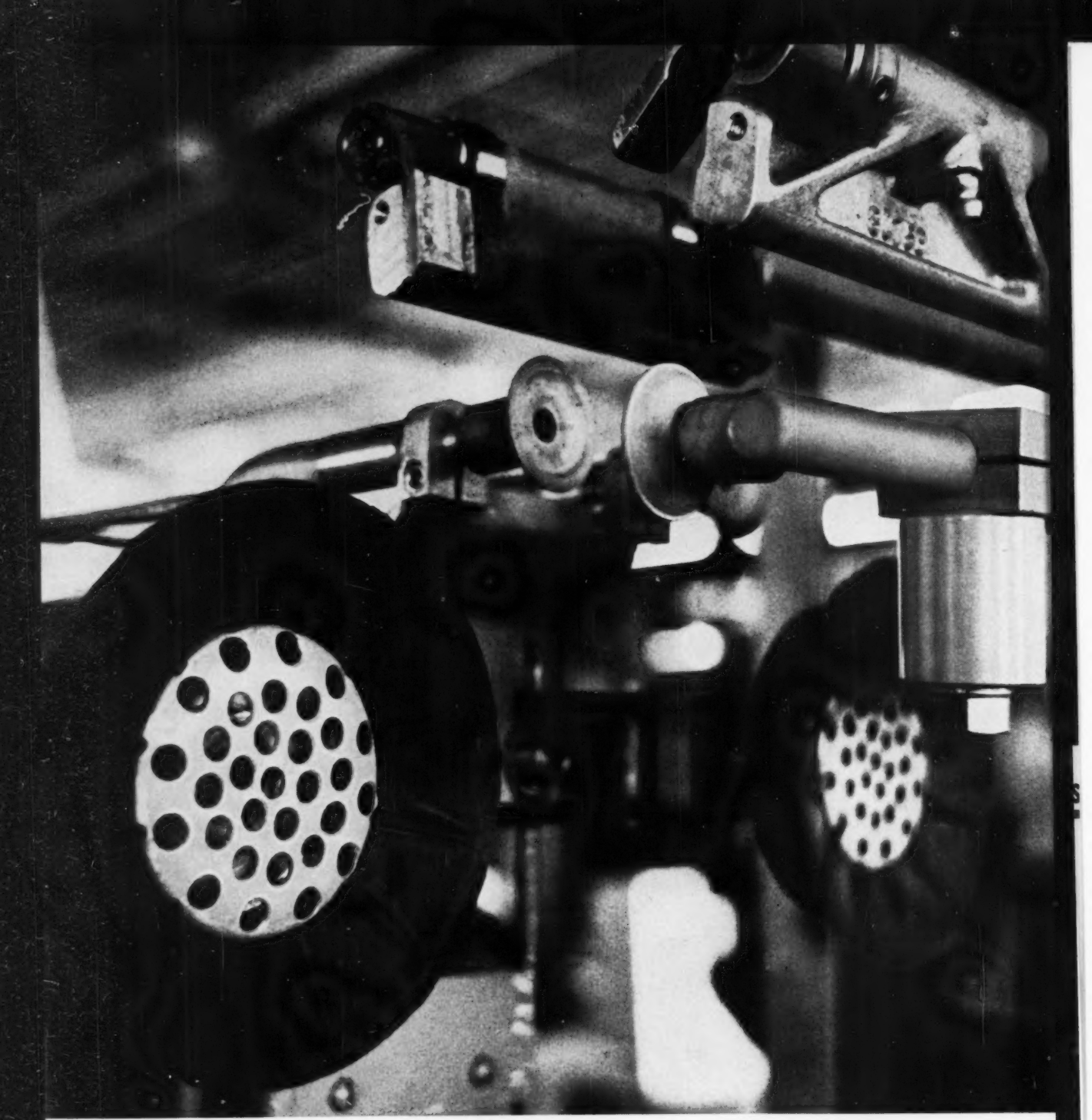

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Best Ways to Protect Refractory Metals Above 2000 F

Technique	*How It Works*	*Status*
Pack coating	Metal is heated for several hours at 1600-2200 F in sealed air-free vessel containing powder mixture ("pack") of elements to be deposited, carrier compounds (halides), atmosphere controlling compounds (ammonium compounds) and inert filler (alumina). Coating diffuses into metal surface, forms a metallurgical bond.	Object of at least half of all current development work, pack coating is used to coat molybdenum with silicides (most advanced coating system). Pack-silicide coatings are also being tried on columbium, as is vacuum-pack deposition of a chromium-titanium-silicon alloy. Pack coating is a hopeful for tantalum and tungsten.
Slurry coating	Powdered metals and activators are suspended in a liquid medium, applied to the piece by painting, dipping or spraying, and deposited by baking off the liquid. Heating at 1800-2100 F for a few hours in absence of oxygen bonds the coating.	Based on ceramic technology, slurry coating is just entering the metal deposition field. A promising aluminide coating for columbium is being developed, and a similar coating (including tin) is being studied for tantalum.
Hot spraying	The two types of hot spraying are flame spraying, using oxygen and acetylene, and arc spraying, in which the atmosphere is inert or reducing and energy is supplied by an electric arc. Both types use powdered coating materials.	Flame spraying has been used to apply several kinds of coatings to molybdenum, some of which are of specialized interest in aerospace use. Arc spraying makes possible gradated metal-oxide coatings, in which layers of mixed metal and oxide are applied.
Electroplating	Electrolysis of metal salts in solution deposits coatings.	Nickel-chromium alloys previously developed for molybdenum plating may have some specialized aerospace uses. And deposition of platinum-group metals—especially on tungsten—is being tried.
Hot dipping	Metal is dipped into molten coating.	A hot-dip zinc coating for columbium is promising, but for use below 2000 F. Studies of aluminum dips for columbium and tantalum led to development of aluminum slurry coating technique.
Vapor deposition	Halide of coating element is decomposed thermally (over 2200 F) or by hydrogen reduction (at 1200-1600 F) to deposit coating on metal. Some organometallics can be decomposed at about 500 F.	The reduction method can be used to apply adherent coatings of most metals, as well as of silicides, carbides and possibly oxides. The high temperature requirement of the halide thermal process makes it relatively impractical, but the low-temperature organometallic technique can be used to apply nickel, chromium or aluminum.

Hot Search for Refractory Metals Coatings

Probably the biggest obstacle to wide-scale use of the refractory metals—columbium, tantalum, molybdenum and tungsten—in aerospace structural applications today is their rapid and destructive oxidation at the high temperatures encountered.

Chemical processors' interest is especially high in this field, both because of the coating technology involved and because of their substantial stake in the refractory metals.

Norman Geyer of the Air Force's Aeronautical Systems Division (Wright-Patterson Air Force Base, O.) pointed up these problems at last month's Materials Symposium at Phoenix, Ariz. And the seriousness of the situation is further emphasized in this year's report to Congress by the Congressional Joint Committee on Defense Production: "Oxidation continues to be a serious problem in these materials, although millions of dollars

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have been spent in the last 15 years in researching this problem for molybdenum alone without solving it."

Heart of the trouble is that each of the four metals oxidizes at an extremely high rate when heated to 2000 F or more in air—exactly the conditions under which their excellent physical and mechanical properties are needed for numerous aerospace applications (*CW, May 6, p. 87*). And instead of forming a thin protective film, the oxide flakes off and exposes a fresh metal surface. The situation is worst in the cases of molybdenum and tungsten, which form volatile oxides. But columbium and tantalum suffer a compensating problem—that of "contamination," in which oxygen embrittlement of the metal takes place well below the limit of the oxide layer itself.

Attempts to beat these difficulties by alloying the metals have succeeded only at the expense of mechanical properties. As a result, current efforts at protection are concentrated on development of effective and stable coatings and of practical and reliable methods of applying them (*see table*).

Moly Progress: Molybdenum has been the object of by far the greatest amount of work. According to Geyer, about 30 organizations have developed 40 coating systems for this metal alone.

Most effective system yet developed for high-temperature molybdenum use is a silicide coating formed by pack-diffusion techniques. While this coating has shown the greatest lifetime at temperatures above 2000 F, its low-temperature brittleness is a problem.

Key firms recently doing work with silicide coatings include Pfaudler Co. (a division of Pfaudler-Permutit); Boeing Airplane Co.; Ling-Temco-Vought, Inc.; Chromalloy Corp. (together with its subsidiary, Chromallizing Corp.); Fansteel Metallurgical Corp.; and American Machine & Foundry, a recent entry. General Electric, Climax Molybdenum, Molybdenum Corp. and others have also done much work in molybdenum coating.

Other coatings for molybdenum (in special applications) are the nickel-chromium electroplated alloys and flame-sprayed compositions of nickel-silicon-boron, nickel-chromium-boron or aluminum-chromium-silicon.

Columbium Coming: Although

columbium coatings have not been under study as long as coatings for molybdenum, they have been the object of keen interest in recent years, and some promising systems are evident. One is the pack-silicide approach developed for molybdenum. On columbium, however, the lifetime of the coating is not as long as on molybdenum, and processing steps must be more rigorous to avoid contamination.

A variation developed by Thompson Ramo Wooldridge, Inc., is carried out under vacuum and gives coatings with lifetimes above 10-20 hours at 2400 F. It consists of deposition of a 50-50 mixture of chromium and titanium, followed by a layer of silicon. Major advantage of the three-member coating: it is highly ductile. But because of the need for a vacuum, the technique faces scale-up problems.

Another promising system for coating columbium is slurry-coated aluminum alloy. An aluminum-silicon-chromium alloy applied in this way has given a protective coating stable at 2500 F for up to 10 hours. This method's big advantage is its simplicity. General Electric, Sylvania's Sylcor Division and Pratt & Whitney Aircraft are among the firms working with this system.

While those three systems are the best bets, others are drawing interest. The Navy, for instance, is working on a zinc hot-dip system that has been described as self-healing (many coatings become useless when they crack or are chipped) and so far gives a coating effective up to about 2000 F. Hot-dipped aluminum alloy coatings have also been studied, but have largely given way to the slurry-coated versions. A flame-sprayed alumina sealed with refractory glasses is effective for 500 hours at 2300 F, but is relatively thick.

Slower Pace: Work on coating systems for tantalum and tungsten has been much less spirited than on the lighter members of the group. However, interest in tantalum as a high-temperature structural material has spurted in the past year as a result of studies disclosing that its strength-to-weight ratio might be more attractive than that of columbium at temperatures higher than about 2400 F.

The slurry-coated aluminide coating developed for columbium also works well on tantalum. In a varia-

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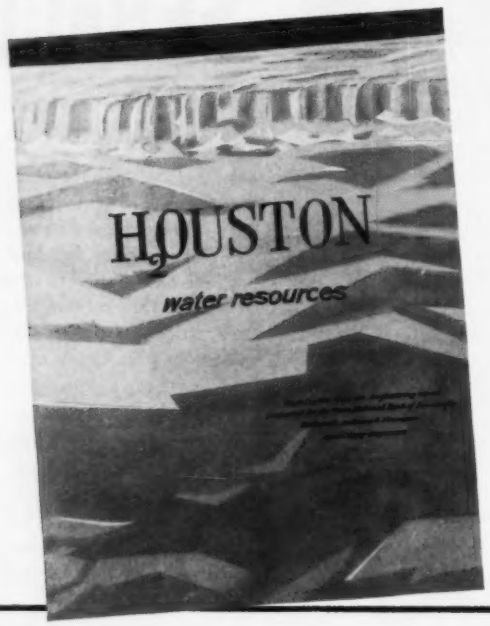

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tion of this technique, addition of a small amount of tin to the coating system produces a coating with lifetimes of 100 hours at 2800 F and a few hours above 3000 F. Sylcor holds an Air Force contract for work in slurry coating of tantalum.

Under another Air Force contract, Battelle Memorial Institute is exploring the possibility of using the pack-siliciding process on tantalum. Protection for 6-10 hours at 2800 F has been effected with silicide coatings modified with chromium or aluminum.

Another system being studied for tantalum protection is vapor-phase reaction with beryllium to produce a beryllide coating. Best results have been obtained with tungsten-containing alloys.

Protection of tungsten itself, however, has been largely unexplored—mainly because the metal's high density and lack of ductility appear to rule out structural applications below 3000 F. Thus, any useful coating for this metal would have to be stable up to about 3500 F.

All tests so far have been made on heated tungsten wire. Rhodium, electroplated over silicon and chromium layers, has shown a lifetime of about one hour at 3000 F. Vitreous-bonded zirconia has survived for three hours at 3600 F. And a silicide coating has lasted for 10 hours at 3300 F. All these studies have been bench-scale and have led to no firm conclusions.

Development of successful coating systems for the refractory metals is clearly a program with two potential payoffs: markets for the coatings themselves and broad new uses for the metals. And the chemical process industries have a big stake in both.

EXPANSION

• Noranda Mines, Ltd. (Toronto, Ont.) will build a $1-million research center near Montreal for work with copper by-products, physical aspects of copper, copper-base alloys and semiconductors, etc. Head of the center is W. H. Gauvin, inventor of the atomized suspension technique for pulp-mill effluent disposal.

• National Aeronautics and Space Administration (Washington, D.C.) is scheduling acquisition of 80,000 acres of land north and west of Cape Canaveral, Fla., for a large space-vehicle launch facility.

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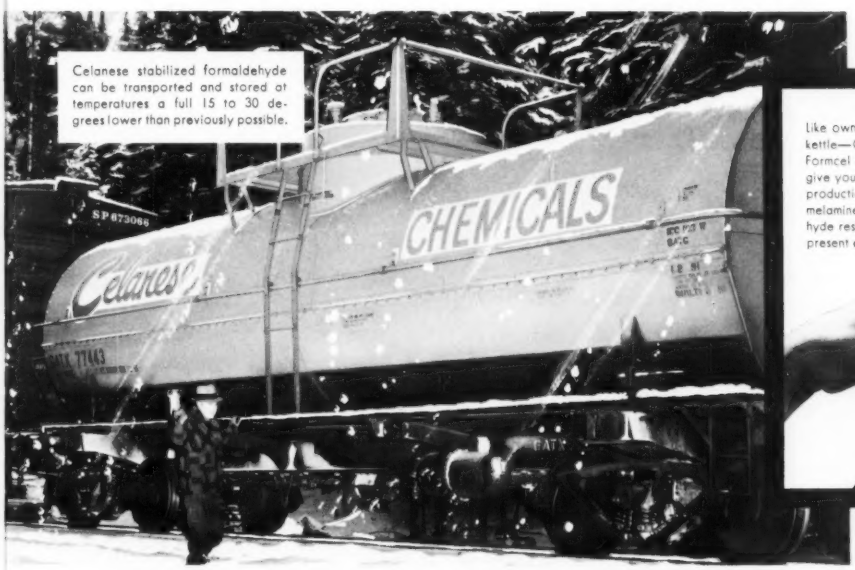
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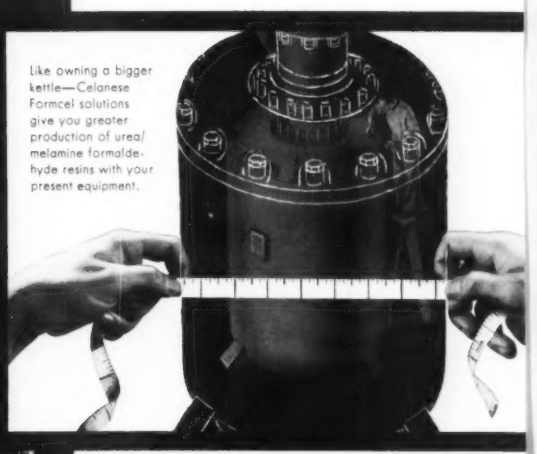
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Getting More Mileage from Control Data

Plant control testing generates quantities of useless and unused information. Challenge for quality-control test groups: how to increase "productivity" of their data.

Everyday this week, as has been the case for years, several thousand entries—weights, measures, chemical analyses—are being put down by a large Gulf Coast chemical producer. The mountain of data, neatly recorded in sheets, is all part of the plant's regular quality-control test program. But, the plant's statistical engineer estimates, only 25% of the entries will actually be put to use. The plant's costly problem—of obtaining information and actually putting it to use—is a typical one in the CPI. Now, glimmerings of a solution are beginning to be seen.

At the recent conference of the American Society for Quality Control's Metropolitan Section at New Brunswick, N.J., Stephen Jurnack, an engineering statistician at American Cyanamid's Bound Brook, N.J., plant, singled out the goal of control data gatherers—a maximum information-to-cost ratio. And, while most companies have sketchily analyzed portions of their control testing programs, formal programs to evaluate all aspects of control testing—to obtain maximum usable information at lowest cost—are only now reaching the payoff phase. And such progress has been made in only a few companies.

Open Minds: The advances so far, however, mark an important revision in basic plant management philosophy. To accept the principle of a maximum information-to-cost ratio, management must be willing to eliminate some control tests as well as strive to improve the usefulness of some test techniques.

"Many experienced chemical manufacturers take pride in the fact that their plants have not had a batch of finished product rejected by a customer in 10 years. But one can safely guess that for at least eight of these 10 years considerable meaningless, costly data were generated along with the information used for decision making," says Jurnack.

Risk and Judgment: However, as the head of one company's plant statistical group points out, deciding to eliminate or reduce the testing of a product requires judgment, involves risks that management often isn't ready to take.

He cites his plant's sulfuric acid unit, which has turned out only one or two small runs of out-of-specification product in over five years. "We proposed reducing test frequency. But management wasn't willing to risk out-of-spec product going to a customer, even though we showed statistically that no laboratory test was foolproof and that small amounts of out-of-spec material could be expected to get through once in a while regardless of test procedures," he says.

On the other hand, Buckeye Cellulose says that it was able to reduce test frequency in one case because of excellent process stability. If its reduced-frequency test result shows the product drifting out of specification, intimate knowledge of the process permits rapid pinpointing of the cause. And, any out-of-specification material can be caught easily before it leaves the process area and be reworked to specification.

Finding a Base: One of the major problems for management is that there is little to go on in determining the value of information by which the information-to-cost ratio can be judged. For example, Cyanamid has tried information analysis of control test programs at several of its plants, it has come up with widely varying results.

Moreover, for competitive reasons, few companies are willing to disclose how much they spend on product quality-control testing—although a cost of about 2% of product cost is sometimes given guardedly as a general figure. But as Harry Hehner, manager of quality control for Monsanto's Organic Chemicals Division, puts it, attempts to generalize are meaningless because some processes must be operated within limits where there is no margin for error and control test costs are high, while in other cases the specification limits are wide and easily met.

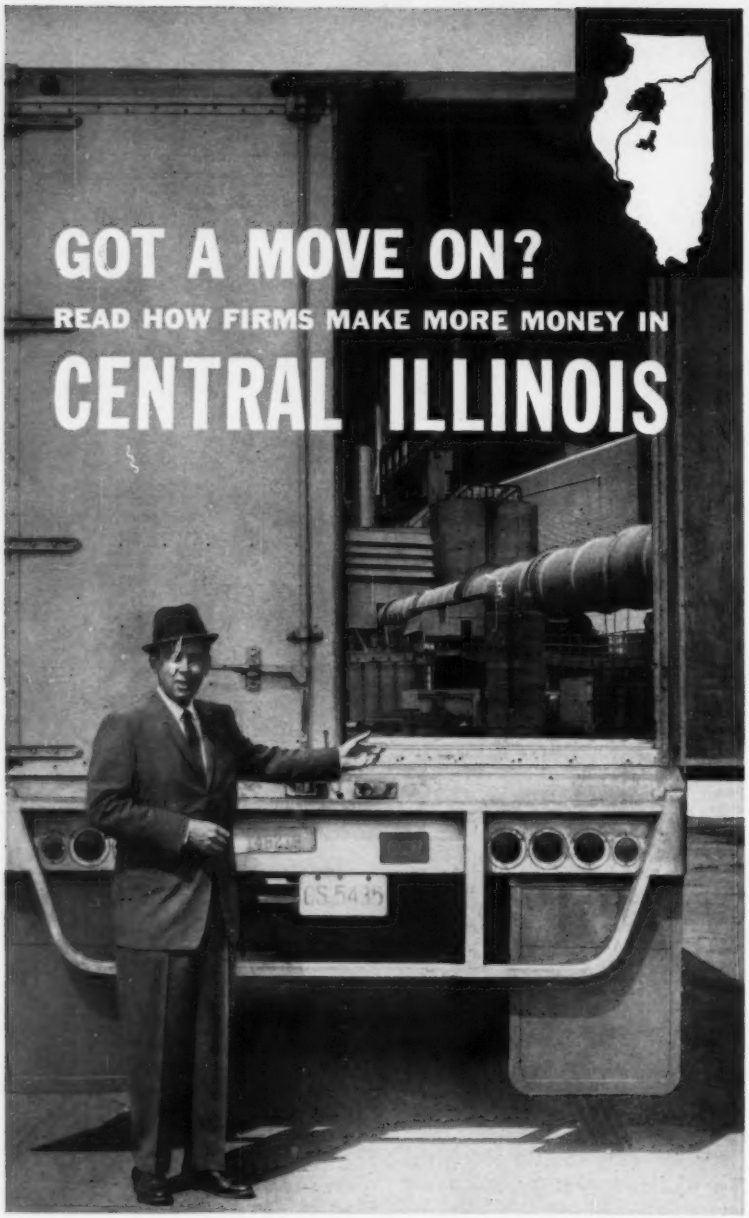
For Statistics' Sake: Some statistical engineers feel that plant management reluctance to eliminate or cut control testing is directly attributable to the attitude of the plant's statistical quality control group. "Some groups seem to operate on the principle of statistics for statistics' sake. Under those conditions it is difficult to talk of cutting back on data taking," says one group leader.

And, it is easy to see how management has often gone along with the statistics-for-statistics'-sake approach. As Arthur Johnson of the statistical services section of Procter & Gamble's Research and Development Division points out, "The statistical function has appeared relatively recently on the industrial scene, has been very fashionable in management literature and has perhaps been somewhat abstruse in subject matter and application . . . [to] . . . the nonprofessional statistician. In addition, the professional in the statisticial area has often had to be both information gatherer and interpreter-manager, with the result that the function has suffered."

Johnson adds that the statistical manager often tries to do too much —apply all he's learned—only to get bogged down in the mechanics of applying a few basic procedures. And it takes a lot of tact to convince plant operators with years of plant experience that a few lines on a chart can usefully supplement his decision-making ability.

Although many of the advanced techniques are continuing to grow in importance, the area that now seems nearest payoff in improving the information-to-cost ratio is the statistical quality-control chart. Although some chemical companies have used them for years, many have been late-comers in their use (*CW, Jan. 3, '59, p. 30*).

Cyanamid's Jurnack says that as the users become more familiar with the plots, learn to recognize trends, etc., they are in an ideal position to make recommendations for



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the elimination or reduction in control test frequency. The problem then is the effectiveness of the communications link. When there is control test trouble the effectiveness of the communications link between laboratory, technical and production groups can easily be determined. But when there is no trouble, an indication of the effectiveness of the communications link is totally lacking, Jurnack says.

There is little question that control test programs will always generate much information that is either not useful or never used. But with the increase in cold, calculated looks at control test data, there is no question that much of the statistical chaff will be eliminated. It is the least glamorous but one of the most important tasks facing plant statistical groups today.

Speedy Coupling

A new coupling for thin-walled pipe and tubing requiring quick disconnection and assembly has been developed by Cooper Alloy Corp.'s Valve & Fitting Division (Hillside, N.J.). The coupling is touted as a strong, quickly installed, inexpensive method of joining thin-walled pipe or tubing (between 15-25% lower purchase cost than older systems).

This type of connection is growing increasingly important in the chemical industry, where thin-walled pipe or tubing is often taken apart (e.g., in pilot-plant opperations or on lines that tend to plug). CAC's new device, called a Quikupl, differs from conventional couplings, which require (a) threads (walls thinner than 0.065 in. can't be threaded thus ruling out threads for tubing thinner than 16 gauge and pipe below schedule 40); (b) flared tube ends (which weaken the joint); (c) welded sleeve or backup flange reinforcement (which extends pipe-fitting time per joint.

According to CAC, connections can be made with a Quickupl up to five times quicker than conventional couplings. The joint requires no special skill since only one simple tool is used for the complete range of couplings for ¼-in. to 6-in tube or pipe diameter.

The tool, described as a clamp and cutter arrangement mounted on a board, is used to place a small ridge around the tube near the coupling.

This ridge holds a washer, which in turn keeps the tubing from slipping away from the coupling. This ridge, CAC says, does not change the pressure rating or weaken the tube.

The coupling (in steel or stainless steel) consists of a cylindrical conector piece into which the tubing fits (the connector may be used with plastic pipe or tubing). This coupling acts as a bearing surface to assure proper alignment. Nuts, which turn on large acme threads on the connector piece, draw the ends of the pipe or tubing against a gasket.

Gasket Limits: One possible drawback of the new coupling is the gasket. Reason: the neoprene or Teflon gasket offered by CAC as standard gasket material limits the temperature and corrosive applications of the joint. Teflon degrades at temperatures above 500 F, neoprene at much lower. The pressure rating of the pipe, however, is unchanged by the coupling. Other materials would have to be selected if the coupling were used under special flow conditions.

EQUIPMENT

Anti-Icing Additive Injector: An additive injection system designed for blending anti-icing fluid with aircraft jet-engine fuel has been developed by Chandler Evans Corp. (West Hartford 1, Conn.) under the name Ceco Liquid Ratio Controller. The unit can handle fuel flow ranges up to 10,000 gal./-minute and control preselected additive ratios with less than 2% error. It can also be adapted to chemical processes and fuel blending operations. It comes either skid-mounted or as a mobile unit, measures 39 x 23 x 26½ in. Included: A motor-driven additive pump that supplies the unit's metering system with pressurized additive at a pressure level that is set by the jump relief valve.

•

Level Controller: A simplified level controller that does not contact the material being measured is a new offering by Ohmart Corp. (4241 Allendorf Dr., Cincinnati 9). The device is designed for use on almost any size or type of vessel, gives continuous level indication and control. It uses the Geiger-Mueller principle of radiation detection. Sensing heads are housed in thick, explosionproof steel tubes. Be-

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The point about urethane foams is that they can be tailor-made to fit so many different specifications—when formulation is precisely controlled. This is where Wyandotte's custom-blending of urethane-grade polyols works to your advantage. Drawing from a long line of PLURACOL® diols, triols, tetrols, and hexols—we work with you to fit the formula to the foam. It isn't the simplest approach (for us)—but it does bring out the best in foams (for you).
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Tuf-Flex is another example of St. Regis *Packaging-in-Depth*. This complete bag service assures you of the *right* bag, the *right* machinery to pack it, plus skilled engineering services. To meet your *future* needs, it includes research to develop improved packaging methods and economies.

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In Canada, contact St. Regis Consolidated Packaging Co., Ltd. PAPER COMPANY

cause there are no moving parts, high- or low-viscosity materials at temperatures between −60 and +150 F can be controlled without clogging the instrument, Ohmart says.

•

Metering Valve: Vactronic Lab Equipment Inc. (East Northport, N.Y.) has introduced a new precision metering valve for precise regulation of gases, pump-speed measurements and vacuum control. Complete control of the fluid leak rate is attained with a nonrotating, linear micro-groove stem. The device adjusts flow rates from 0.01 to 5 cc./second.

•

Gear Pump: The Helifern is a new all-purpose helical gear pump offered by Fernholtz Manufacturing Co. (8466 Melrose Pl., Los Angeles 46). Tubular construction is said to eliminate some castings, cut weight and simplify servicing. The pump is available in nine sizes with capacities from 1 to 500 gpm.

•

Cryogenic Control Valve: Leslie Co. (67 Delafield Ave., Lyndhurst, N.J.) is marketing a new throttling control valve of the globe type. The valve has no seat-ring-thread and crushed-gasket leakage problems, closes tight even when there is wide temperature variation between startup, onstream and defrost periods. The valve is disassembled from the top, permitting quick inspection when valve is imbedded in heavy insulation in a cold box. Sizes: ½ to 4 in. in bronze and aluminum bodies, ½ to 2 in. in stainless steel bodies.

•

Temperature Regulator: A low-cost temperature regulator for control of small loads using low-pressure differentials is a new product of Spence Engineering Co. (Walden 2, N.Y.). Available in sizes up to 2 in., the regulator is direct-operated, will control temperatures between 50 and 250 F. Called Type T2, the unit is used when the difference between inlet and outlet control pressures must be less than 3 psi.

•

Degreasing Gun: Spraying Systems Co.'s (Bellwood, Ill.) new No. 6960-22 GunJet spray gun uses air pressure to provide a hard-hitting spray for degreasing equipment parts with a small quantity of cleaning solution. Liquid, including rinse water, is drawn into

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MICHIGAN ALKALI DIVISION, WYANDOTTE, MICHIGAN

BULLETIN:

New Shell pocket computer helps calculate the evaporation rate of a hydrocarbon solvent in minutes—can be used right at your desk

Shell has invented a handy six-inch computer that lets you calculate solvent evaporation rates at your desk. It's called the Evapo-Rater.*

Here's how it can save you time and help avoid costly trial and error experimentation.

FOR THE first time you can determine solvent evaporation rates without leaving your office.

Shell's new Evapo-Rater does the work for you.

Supplements laboratory device

For years manufacturers have been familiar with the Shell Thin Film Evaporometer—used to determine evaporation rates.

But the Evaporometer resides in laboratories. It is expensive and time-consuming to operate. And it stands about 3 feet high.

So now Shell has invented the new six-inch Evapo-Rater, shown above.

Gives answer in minutes

The new Shell Evapo-Rater is based upon hydrocarbon evaporation rates determined by the Thin Film Evaporometer. It approximates results you can obtain with an Evaporometer, and gives you an answer in a matter of minutes.

The Shell Evapo-Rater makes selection of the correct hydrocarbon solvent quicker and easier than ever. It reduces the need for extensive trial and error experimentation.

New Shell Evapo-Rater, above, determines solvent evaporation rates in minutes. Shell is offering the Evapo-Rater to help users select the correct hydrocarbon solvent.

Works for blends of solvents

And it permits you to determine the evaporation rates for *blends* of hydrocarbon solvents as well. All this can save you valuable time and money.

A limited supply of Evapo-Raters is available for solvent consumers and can be obtained from your local Shell Oil representative. Call him today.

For address of nearest Shell representative, write Shell Oil Co., 50 West 50th Street, New York, N.Y.

SHELL

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the gun by siphoning action provided by air pressure from 20 to 100 psi. The gun has trigger control, which can be locked, is 14-in. long, weighs 14 oz.

•

Magnetic Pump: G. W. Lisk Co. (Clifton Springs, N.Y.) is offering the first unit in its new line of magnetic pumps for corrosive, nuclear and similar hard-to-handle fluids. The pump's only moving part is a plunger that is actuated by a magnetic field. The unit will deliver 4 gpm. at 30 psi., requires 170 watts of power, operates on 107-volt dc. from a rectified 115-volt ac. source. Pump bore is lined with Type 304 stainless steel or Monel; plunger is encased in Type 304 stainless steel or Monel.

•

Teflon Packing: A new, relatively high-heat resistant Teflon packing for high-speed rotary pumps is now available from Du Pont (Wilmington, Del.). The new packing, according to Du Pont, has improved service life and can be installed easily without run-in. These advantages are obtained by removing the carbon by bleaching and preshrinking the fiber at 580 F before braiding.

•

Miniature Valve: Circle Seal Products Co. Inc. (2181 East Foothill St., Pasadena) is offering a new miniature solenoid valve for pilot plants, test systems, and control circuits. The new valve is claimed to have a novel actuating principle that permits the poppet to open against pressures up to 3,000 psi. with negligible pull against the solenoid. The valve is available with nylon or Kel-F for tight sealing in corrosive fluids at temperatures from −40 to +160 F.

•

Filter-Collector: A new filter-collector with preassembled, individual sock-cage construction is now being offered by Young Machinery Co. Inc. (Muncy, Pa.). The new unit is said to reduce downtime to a few minutes, cut leakage around the frames and simplify filter replacement. Filter sock-cage design, called Uni-Cage construction, permits individual filter removal and replacement with spare units. Lightweight castings are an integral part of the frame, eliminate the need for clamp-over wires. The collector has a self-centering device including rinse water, is drawn into

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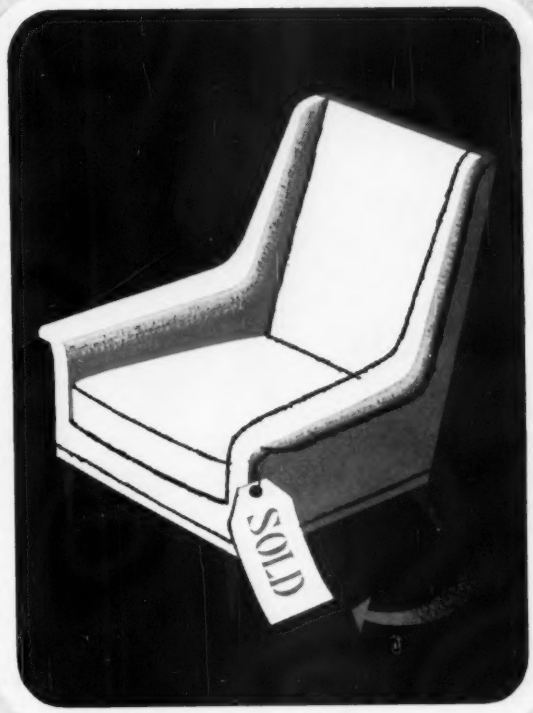

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Market Newsletter

CHEMICAL WEEK
October 7, 1961

Will the vinyl chloride price hike stick? It's still too early to tell, but vinyl chloride monomer producers are studying Allied Chemical Corp.'s move this week to raise prices ½¢/lb. Allied's new price—8¢/lb., f.o.b. its Moundsville, W.Va., plant—is slated to go into effect Nov. 1.

Among other producers, Union Carbide Corp., Monsanto and Dow indicate they lean toward going along with the new price, but desire additional time to study the situation before coming to a decision.

Allied said the price boost was "necessitated by higher operating costs associated with the manufacture of vinyl chloride monomer." This is the first price increase since a series of downward price moves in the industry (*CW, July 29, p. 59*).

•

Polystyrene prices are still up in the air. Dow Chemical, which said it would follow Rexall in boosting the price of crystal material 1¢/lb. (*CW Market Newsletter, Sept. 23*) has temporarily deferred its original plans to set Oct. 1 as the effective date of the increase. Buyers won't know until after Oct. 9 just when the price increase will go into effect.

•

Houston Chemical is now selling tetraethyl lead from its new, 100-million-lbs./year plant (capacity was upped from the originally scheduled 65 million-lbs./year) at Beaumont, Tex. Houston Chemical—an affiliate of Philadelphia and Reading Corp.—joins Du Pont and Ethyl Corp. as the third contender for a share of the current 770-million-lbs./-year, $270-million market for antiknock additives.

Houston Chemical claims its original sales goal of 10% of the total market (about $27 million) has been increased to more than 15% ($40 million).

The firm's new gasoline additives unit is part of a Beaumont complex that's expected to sell more than $50 million/year worth of automotive chemicals. Scheduled to go onstream later this year is an 80-million-lbs./year-capacity plant for production of ethylene oxide and eventually ethylene glycol. Houston's glycol sales are expected to bring in $10-12 million/year.

•

Manufacture of dynamite and blasting powder has ceased at Hercules Powder Co.'s Bacchus plant (Salt Lake County, Utah). Almost 50 years of production of explosives came to a halt because of changing conditions in that market—particularly since the invasion of ammonium nitrate into mining and construction uses (*see also p. 111*).

The Bacchus plant will continue to make solid propellants for the Minuteman and Polaris missiles—hence employees won't lose their jobs. Hercules' dynamite plant at San Francisco will take on added production to compensate for termination of the Utah dynamite operations.

Construction of a $3.5-million vinyl resins plant has been completed by B.F. Goodrich Chemical at Altona, Australia (near Melbourne). Raw materials for BFG's Geon vinyl resins come from other plants in the Altona complex. The new plant is operated by B.F. Goodrich-C.S.R. Chemicals Pty. Ltd., a company formed early last year by BFG and the Australian firm, which also makes plasticizers for polyvinyl chloride.

•

A new, 2,000/year polypropylene plant is now going onstream in Japan. Tokuyama Soda, which claims to have developed its own polypropylene technology, plans to increase production to 10,000 tons/year by mid-'63 and to 20,000 tons/year by mid-'64.

•

Escambia Chemical will begin making urea solutions in early '62 at its nearly completed 20,000-tons/year plant at Pace, Fla. It is one of a number of new units coming in this year, which will lift total U.S. urea capacity (for agricultural and industrial uses) to almost 1 million tons/year—about 200,000 tons more than a couple of years ago (*CW Special Report, Aug. 26, p. 33*).

Escambia's output of urea solutions will be used to make Bay-Sol ammoniating solutions and Ammo-Nite direct-application solutions. The company has no plans at present to produce solid urea; however, the current expansion is the firm's third general boost of nitrogen operations in the past year.

•

Total U.S. carbon black capacity gets another boost as the Sid Richardson Carbon Co. puts its new, 50-million-lbs./year plant onstream at Big Spring, Tex. The plant represents the firm's initial entry into production of furnace black although the company has long been a major producer of channel black.

Output of the new plant is intended primarily for tires and other synthetic rubber products. Raw material—a heavy residual fuel oil—will be pumped in from Cosden's nearby refinery; carbon black will be made via a process licensed from United Carbon.

Others coming in with new carbon black units include Continental Carbon, which recently put a 50-million-lbs./year furnace black unit into operation at Bakersfield, Calif., and United Carbon, which is building a 64-million-lbs./year unit at Mojave, Calif. (*CW Market Newsletter, Aug. 19.*)

•

A new joint production-marketing venture brings together Borden Chemical and North American Coal. Borden will be exclusive sales agent for North American's alum (Miral) to be produced at NAC's new, $2-million plant being built at Powhattan Point, O. The alum will be sold mainly to the U.S. paper industry.

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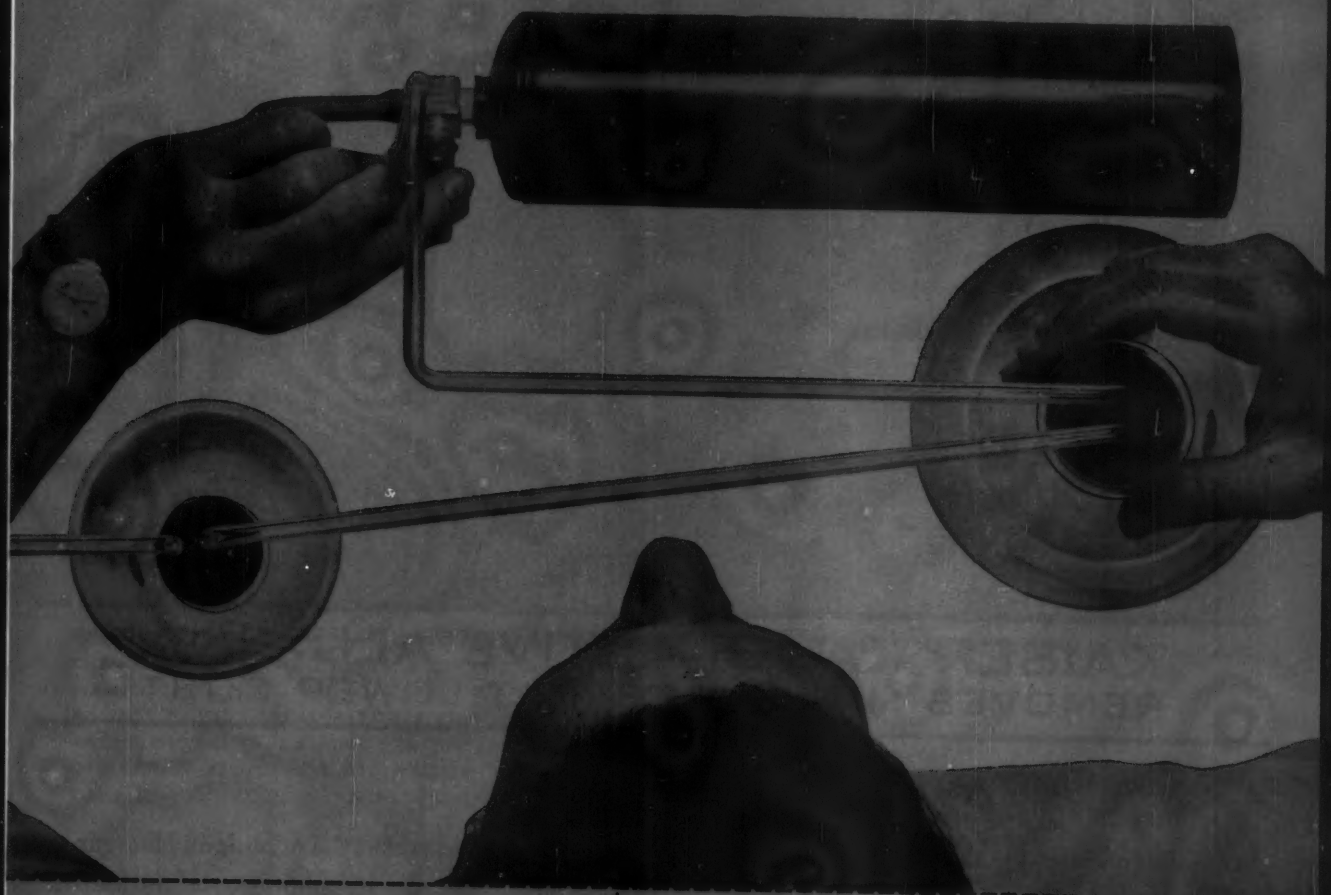

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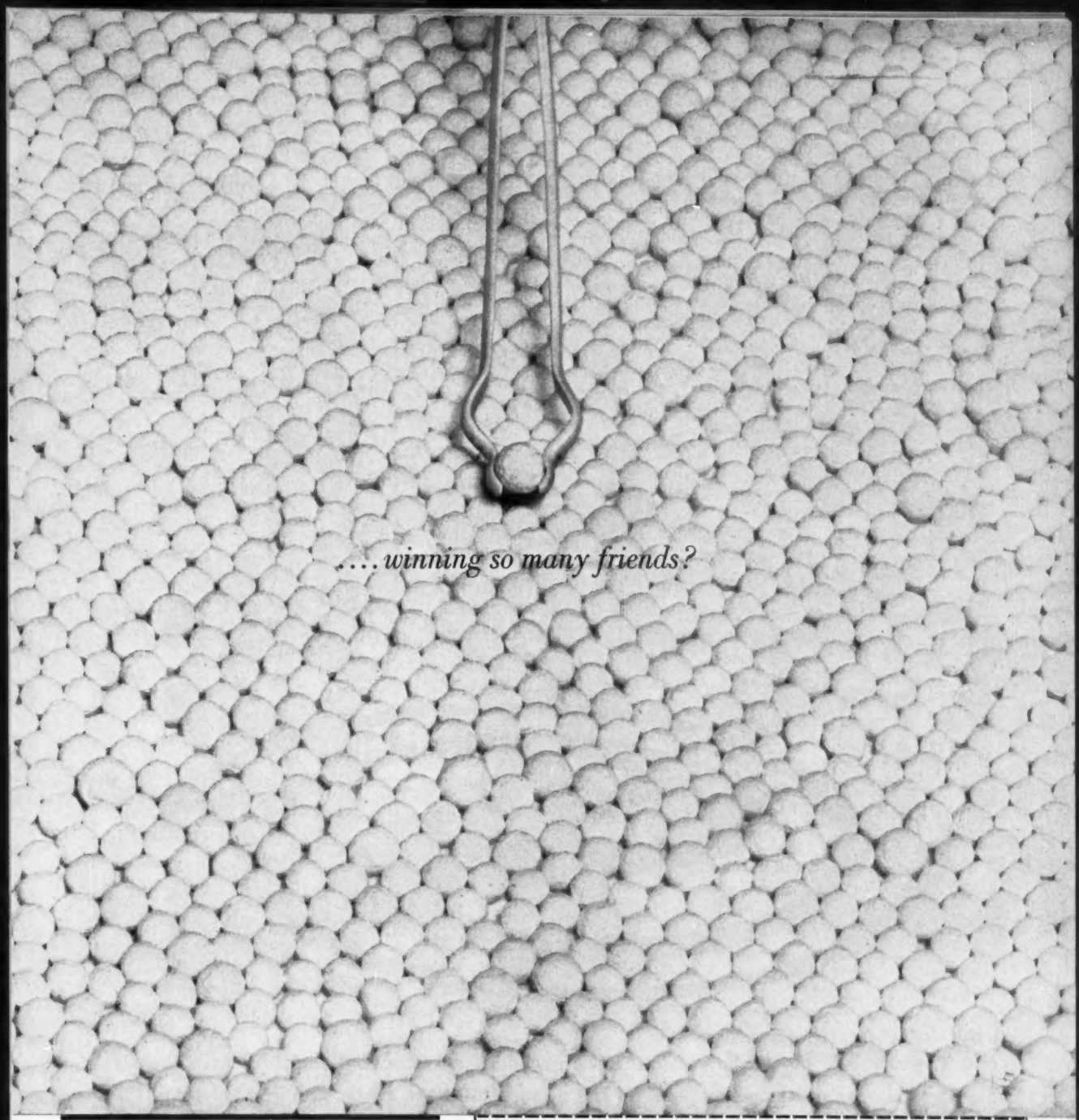

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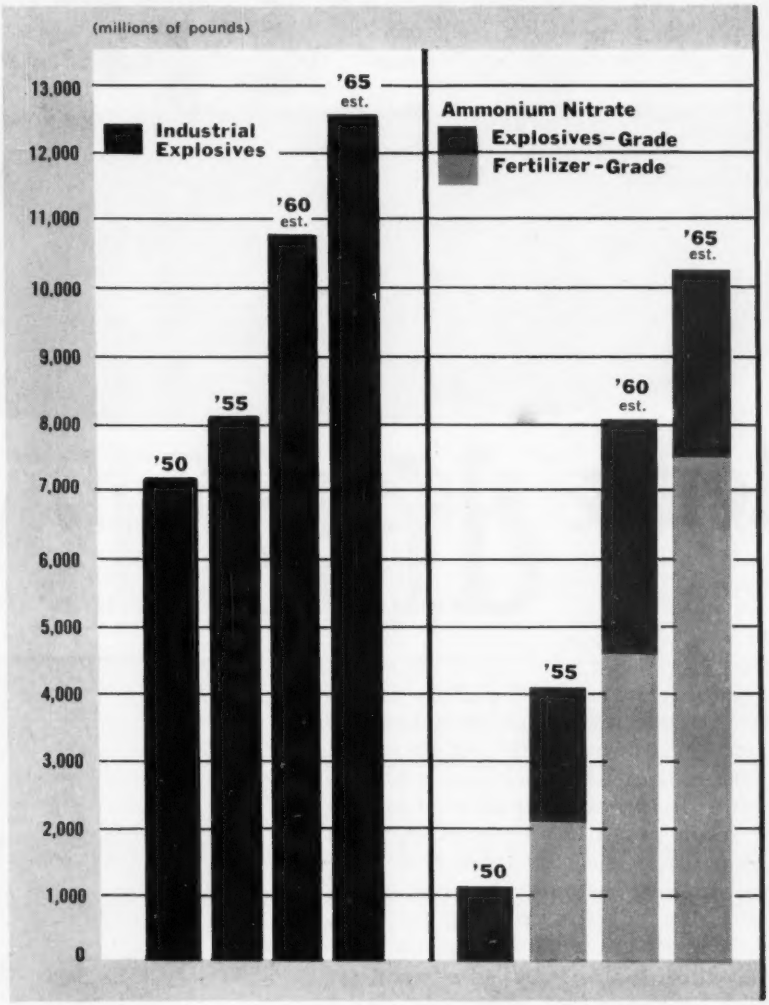
SHARPLES

REPRESENTATIVES AND ASSOCIATED COMPANIES THROUGHOUT THE WORLD

Ammonium Nitrate Gains in Industrial Explosives



Explosives' Pattern Shifting

Although ammonium nitrate has carved itself a sizable share of the total explosives market in recent years, there's new evidence that the trend toward this material is just starting to pick up momentum. Several new technological developments are opening up brand-new explosives markets for the product.

Up to now, ammonium nitrate has chalked up its biggest gains as a replacement for dynamite as a blasting agent in dry-hole strip mining. Here, simply pouring the nitrate into the bore holes, adding the required fuel oil and detonating has shown definite economies. Moreover, on-the-site mixing plants are providing more homogeneous mixes and therefore a more efficient explosive.

Now prospects for the material are brightening in two new areas:

(1) Wet-hole strip mining. Slurries of ammonium nitrate with TNT as a sensitizer are reportedly gaining quick acceptance by miners in both medium- and large-diameter holes. (Slurries usually consist of about 65 parts ammonium nitrate, 15 parts water, and 20 parts TNT.)

Several firms have carried out research in this field. Hydromex is an example of such a product—a joint development of Iron Ore Co. of Canada in cooperation with Canadian Industries Ltd. Although slurries are now used only in the larger-bore holes, experimental data indicate feasibility of using them in smaller-diameter holes.

As soon as the slurry prices start to slide from their current level of 15-18¢/lb., it's a good bet that slurries will make further and substantial inroads into the explosives market—at the expense of dynamite.

(2) Underground mining. Previously infeasible in this use because of toxicity problems, ammonium nitrate is finding wide application in salt and potash mining (where the explosion area is relatively large and fumes are easily removed). And it may find use in coal mining.

The Swedes and Norwegians have already made the switch to the nitrate in underground mining and have almost completely replaced dynamite. In this country, the same trend is in progress.

Explosives makers do not feel that ammonium nitrate will make inroads in coal mining because of ventilation problems. But nitrate makers claim the chemical is no more toxic than dynamite if proper proportions of the nitrate and fuel oil are used.

Explosives manufacturers also claim a higher explosive efficiency and preference by users for "packaged" explosives But they are finding dynamite, priced at 19-20¢/lb., hard pressed to compete with ammonium nitrate prills at 3.5-4¢/lb.

Looking at the Market: Ammonium nitrate usage in explosives has grown rapidly. While the total quantity of industrial explosives used increased from 720 million lbs. in '50 to an estimated 1,080 million lbs. in '60—a 50% increase—the amount of ammonium nitrate used in explosives increased from 117 million lbs. to 808 million lbs.—a 590% increase in the same period. It is expected that by '65 an additional 200 million lbs. of ammonium nitrate will be used—boosting the material's explosives usage to more than 1 billion lbs./year.

It's estimated that in '57, only two years after its introduction, ammon-

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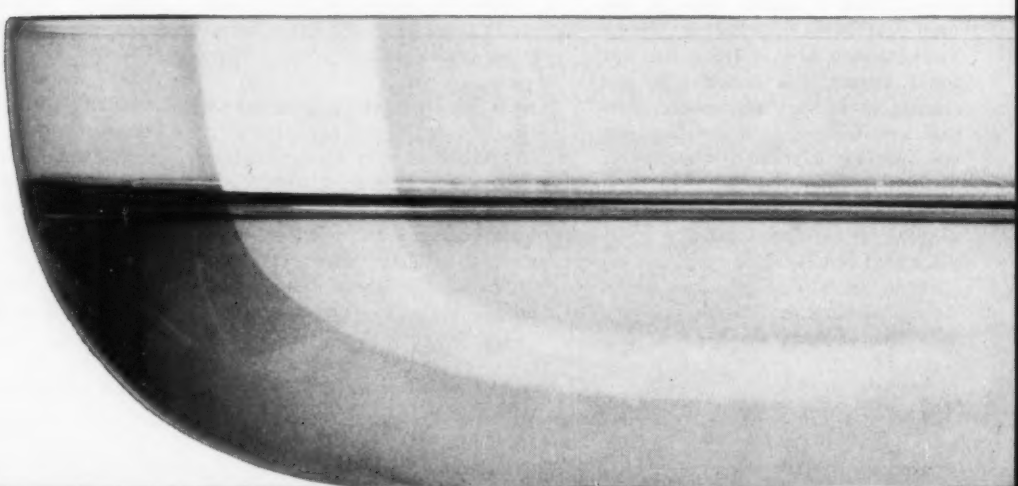

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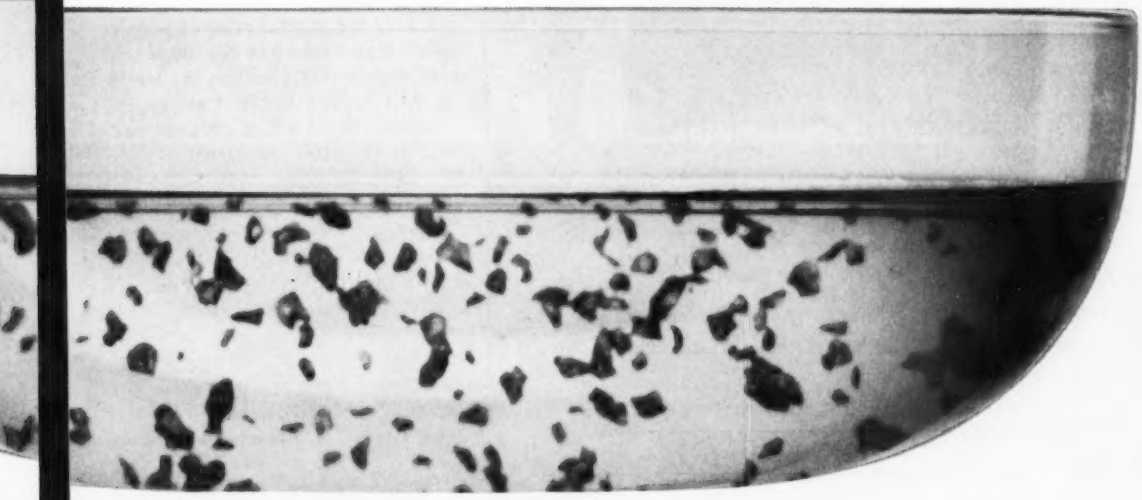

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ium nitrate had cornered 30% of the industrial explosives market. By '60 this was upped to 40-45% and by '65 it will level off at about 50-60%.

Although ammonium nitrate's use as a component of dynamite has been growing (ammonia dynamite has part of the nitroglycerin replaced by the nitrate) principal interest is centered on its use with fuel oil. When it's mixed with fuel oil—94-95 parts to 5-6 parts of fuel oil (5¼-10¢/lb.), ammonium nitrate is claimed to be nonsensitive to impact. It is usually exploded with a detonator (e.g., TNT). This mixture, however, suffers the same weakness as the ammonia dynamites—it is limited to use in relatively dry places (less than 10% water).

Looking Back: Many changes have taken place in the explosives market. According to the U.S. Bureau of Mines, use of black blasting powder is continually declining. Usage in '59 was 1.3 million lbs. Bituminous coal mining was top customer and took 43.8% of the total used. Quarry and nonmetal mining took 15.8% and seismography 2.3%. Other applications took an additional 14.4%.

Meanwhile, consumption of permissible* high explosives has decreased only slightly—83.5 million lbs. in '59 vs. 84.1 million in '58. Coal mining accounted for 98.9% of the total used.

High explosives other than permissibles—including ammonium nitrate—comprise the biggest category of industrial explosives: total demand for these amounted to 956 million lbs. in '59, up 92 million lbs. from '58. Major customers: bituminous coal mining, 24.1%; anthracite coal mining, 5.1%; metal mining, 15.8%; quarry and nonmetal mining, 26.1%; railway, highway and other construction, 22.5%; seismographic exploration, 5.2%; all other purposes, 1.2%.

Dynamite makers are content to retain 50% of the industrial explosives market. But can they compete with less-costly ammonium nitrate? New developments such as higher-density ammonium nitrate—for better packing and therefore higher efficiency (which at least one nitrate producer is piloting)—and a further breakthrough in wet applications as well as under ground mining, could slice another piece out of this market.

* Permissible explosives are high explosives approved by the U.S. Bureau of Mines as suitable for safe use in coal mines, provided specifications are followed.

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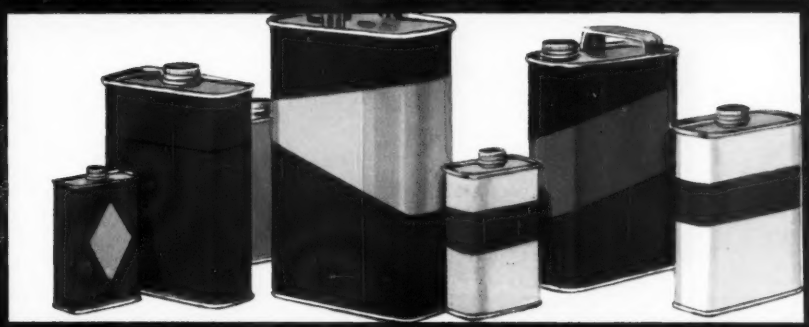

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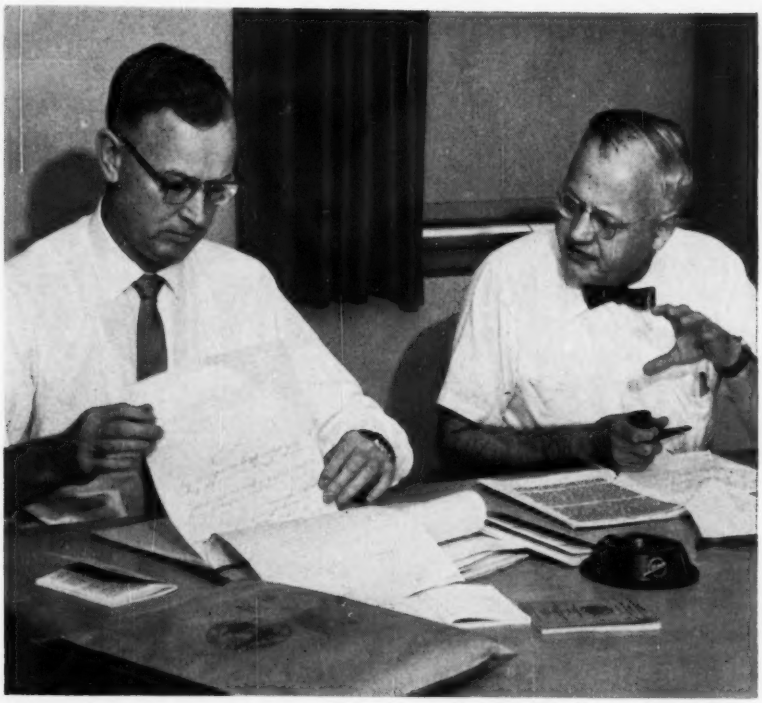


OCAW's Swanson, Amaizo's Langeland probe grievances together.

Extra Step for Labor Peace

A relatively novel step in grievance-handling procedure is saving management time and money at American Maize-Products Co. (Roby, Ind.) —and the union local likes it. Called prearbitration, the plan is essentially closed-door, settlement-level talks between a high union official and a top-management man. It's rapidly becoming one of the hottest topics in labor relations discussions in the chemical process industries.

This week prearbitration sessions are under way on two grievance cases at Amaizo. Chances are that none will require expensive, formal arbitration. In fact, of 78 prior grievances this year (the first year prearbitration has been tried at the company), only one has gone on to arbitration, and it was a holdover from '60. That's in sharp contrast with '58's results (55 grievances, seven requiring arbitrations) and '59's (100, requiring 14). Eight of the 90 cases in '60 (four arbitrations) were held over for prearbitration this year (one went to arbitration).

Complaint Procedure: Workers at Amaizo's Process Division and Mechanical Divisions are represented by Local 7-210 of the Oil, Chemical & Atomic Workers International Union. And this union proposed the system of prearbitration—the program is not written into its current contract with the firm. Here's how the plan operates:

Essentially it requires little modification of the dispute-handling program already in effect. An employee having a grievance still goes first to his boss, usually a foreman, or to the union committeeman (elected by fellow employees, and with a role similar to that of the traditional shop steward). Or he can bypass both and go the the divisional steward or still higher to the union chairman, who is elected by the work force and who is also a vice-president in Local 7-210. The complaint can often be resolved on-the-spot—long before prearbitration is even considered. No records are kept of these discussions.

On Paper: Past that stage, the first formal step in grievance-handling procedure is to describe the grievance in writing. It is then discussed at a meeting of the complainant, his supervisor, the division manager, a member of Amaizo's industrial relations staff, and the employee's department and division union committeemen.

If this meeting doesn't solve things, a meeting of higher echelons is called —the assistant plant manager of the division involved, the division manager, two members of the industrial relations staff, plus the union chairman, vice-chairman, division steward, and two committeemen—but neither the complainant nor his boss.

By contract, the union, if not yet satisfied, must notify management within 45 days that it wants to arbitrate. (Even though the union intends to resort to prearbitration, this formal step preserves the union's rights to arbitration in the event prearbitration fails to settle an issue.)

Prearbitration Fits In: It is at this phase that the prearbitration system may be put to work. Vice-President of Production Earle Langeland and Tyler Swanson,* OCAW's International Representative in District 7, get together for prearbitration talks.

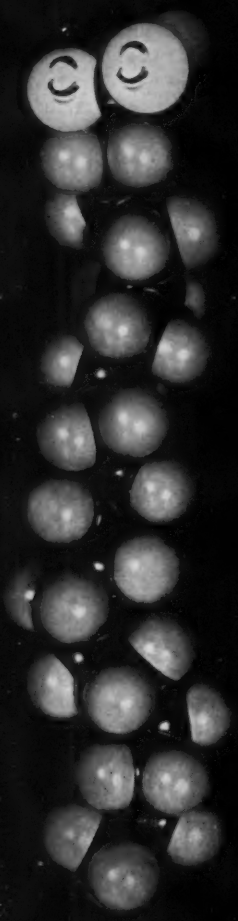
Both Langeland and Swanson are thoroughly acquainted with the contract between Amaizo and OCAW. Both have been closely involved in labor negotiations for at least a decade. In a closed room, they talk things out. There are no witnesses, formal exhibitions, briefs, documents, and the like.

Occasionally, Langeland may clarify a date or other minor point with Amaizo's industrial relations manager, Thornton Higgins. Otherwise, discussions are so unimpeded that three to five grievances can be handled at a typical prearbitration meeting of only two hours or so.

If, as a result of discussion, Langeland and Swanson come up with a solution that "both parties can live with," Langeland dictates a memo on the settlement. Swanson gets a copy.

Langeland has authority from Amaizo to make a firm settlement. But since the union must vote on any proposed settlement, Swanson takes

* Swanson spends most of his time on problems of Local 7-210 (headquarters at Hammond, Ind.), which has 4,000 members, 700 of them at Amaizo. The other major contracts are with Swift, Mobil Oil, Cities Service, Sinclair, etc.



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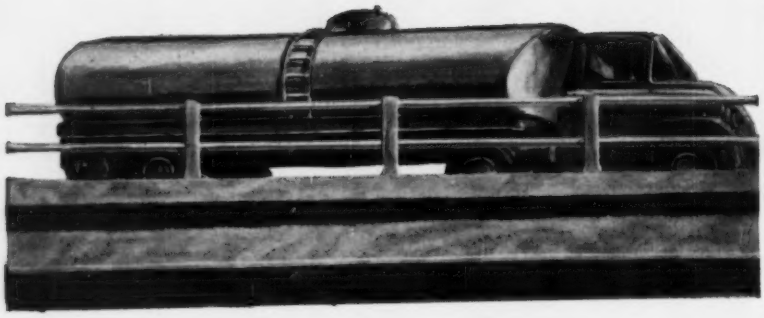

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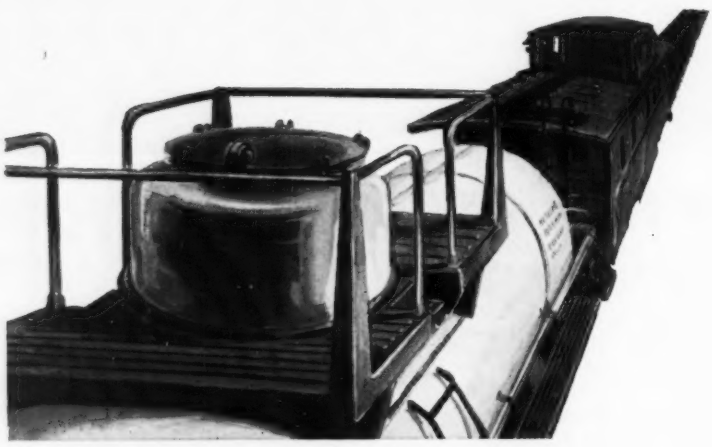

the proposed agreement to his local committee meeting (which is held every other Tuesday). If the committee approves, Thornton Higgins puts the arrangement into effect immediately. Company and union representatives sign the necessary statement.

An important rider is attached to this document. It notes that use of prearbitration in the specific case does not establish a precedent, although the settlement agreed upon is legal and binding.

Arbitration Outlay: If prearbitration doesn't work, the alternative of arbitration is still open. But the "facts of life" in this recourse explain why both union and management at Amaizo have welcomed prearbitration. For one thing, since union and management have difficulty agreeing on selection of an arbiter, they must go to the Federal Mediation Conciliation Service (FMCS) for help. FMCS submits five names of potential arbiters. The party that initiates the arbitration (always the union) can eliminate two names, then the other party in essence "chooses" the mediator from the remaining three names.

Cost of having an arbiter is another factor. This cost is split equally between the union and management. His fee: $125-150/day. Generally he is needed for at least four days (for hearings, writing the brief, etc.). Travel costs — $25-30/day — are extra.

Amaizo pays for the court report, gives a copy (free) to the arbiter, will furnish one to the union at 30¢/page. Transcripts average 150 pages. Amaizo attorney costs are $200-250/day. Over-all, Amaizo figures, it costs the company $750-$1,500 to be involved in an arbitration case.

A typical arbitration case costs the union $350-400. Occasionally the cost may reach $600-700. The union representative is paid $25/day.

Talking Pays: Amaizo's Langeland points out several advantages inherent in prearbitration, not the least of which is the cash saving, which could be as much as $12,000/year for the firm.

Prearbitration can settle certain issues that don't involve important points but have generated strong feelings on both sides in preliminary grievance meetings. The man-to-man technique of prearbitration allows freedom of expression, permits a

SILICOLOGY

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Vegetable Starch	4.0
UNION CARBIDE LE-46 Silicone (35% Silicone)	0.7
SAG 470 Silicone Antifoam	0.5
Methyl "Parasept"	0.17
Propyl "Parasept"	0.03
TERGITOL NPX	0.1
Distilled Water	94.5
Perfume	q.s

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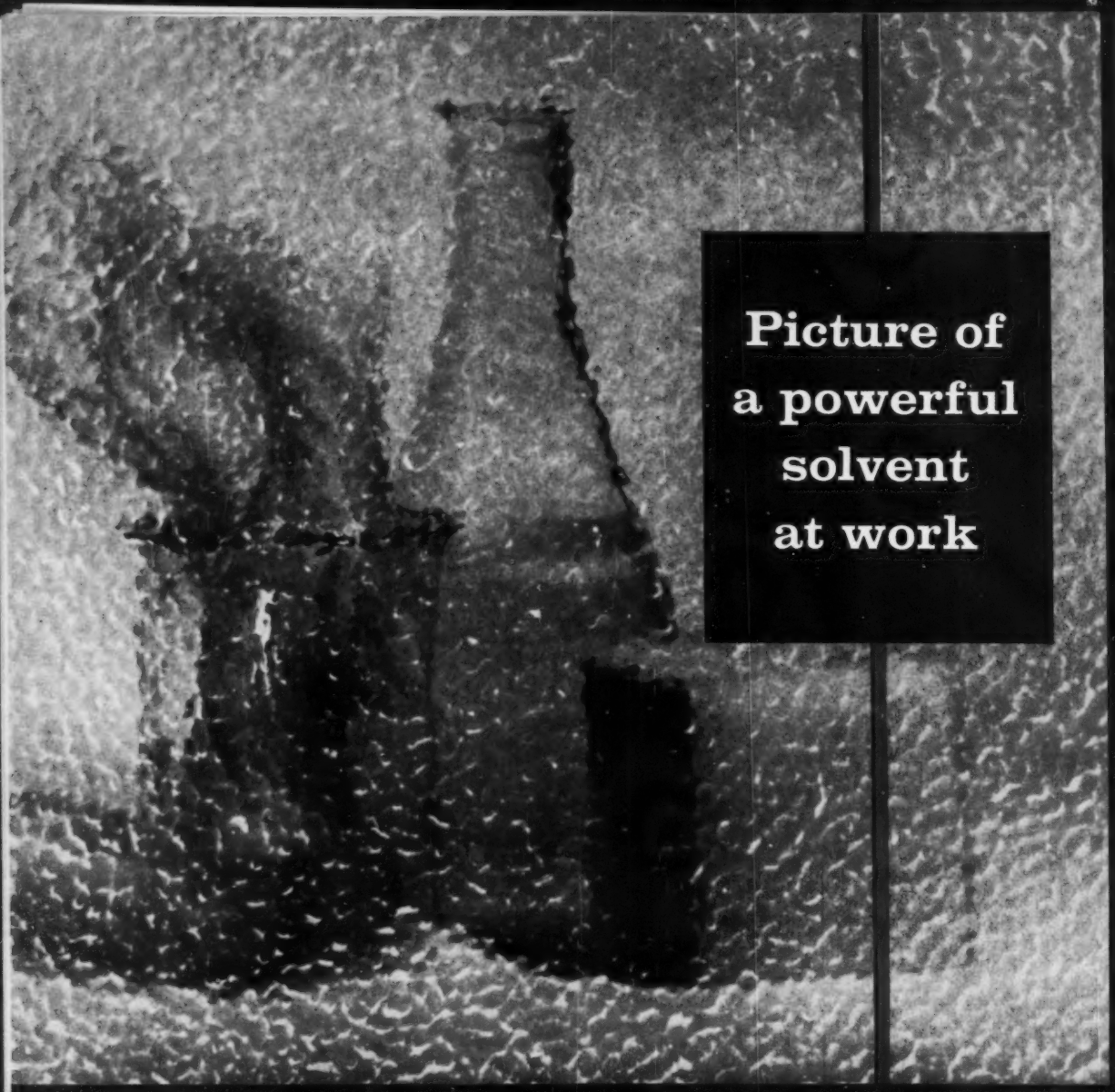

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certain amount of "horse-trading." It also is conducive to good labor relations, and it saves executives considerable time (an arbitration case can take 60-90 days to complete).

OCAW's Swanson agrees but sees one potential disadvantage: management could use prearbitration to delay action on grievances that could have been settled at the first or second steps of grievance processing. So far, this hasn't happened.

Langeland also feels that it is important for the prearbitration step not to become "just another step in the grievance machinery," suggests that the union itself might not make a really serious effort to settle problems at early grievance hearings.

Typical Cases: No matter how devotedly the grievance groups work in the preliminary steps, however, some seemingly simple matters sometimes are not settled—and that is where prearbitration is most effective.

For example, one employee claimed that he was called by phone on a Saturday afternoon and told by a plant official that the production schedule had been changed and therefore he was not to report to work until the following Tuesday—although his schedule called for his reporting on Monday. As a result, he did not report until Tuesday, worked a day-short week, and complained that the company owed him eight hours' pay for the time lost. The company checked with the person making the telephone call, concluded that the complainant misunderstood instructions that were given correctly. The early meetings on this came up with no solution. The grievance was finally settled by the prearbitration duo, which gave the employee an extra day's work instead of payment for the time lost.

Typical Attitudes: Prearbitration in cases of this type has been helpful for many companies. Berry Refining Co. (Gary, Ind.) has used the method for some time, observes that all settlements have been compromises rather than victories for one side or the other. Berry President James Van Pelt says the essential ingredient in prearbitration is "a spirit of cooperation on both sides."

A. Samuel Cook, Baltimore attorney and labor counsel to W. R. Grace & Co. (including the Davison Chemical Division), reports that up to 75%

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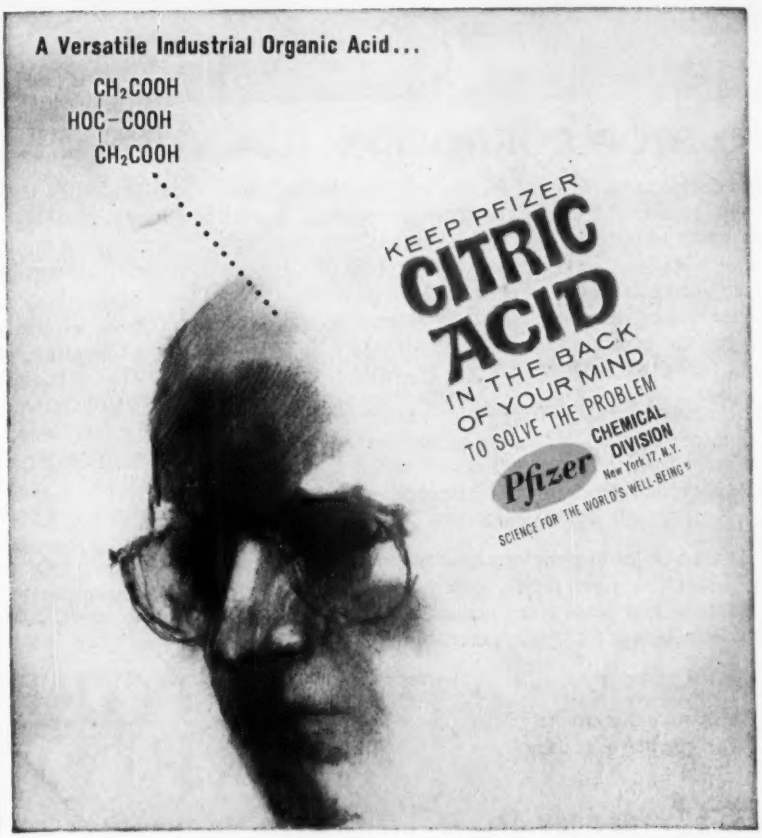

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of grievance cases are resolved or dropped at prearbitration sessions. He tells CHEMICAL WEEK, "The prearbitration meeting can wash out many political or face-saving gripes and point up the critical, important disputes."

Not Unanimous: But not everyone is satisfied with prearbitration as a grievance-handling tool. Union Carbide Corp. has tried it and discarded it as "not useful" and a "waste of time." Carbide says it prefers to depend on the judgment of committees. Cities Service has also discarded prearbitration.

And headquarters spokesmen at both OCAW and the International Chemical Workers Union are reluctant to endorse prearbitration without reservations. OCAW would like to see more grievances handled in the initial steps, decries the trend toward settling problems at higher levels. OCAW's biggest volume of grievances (and arbitration cases) develop from "old contracts that covered conditions in plants that are outdated by new technology and where working conditions and duties have changed." OCAW would like plant managers to be "empowered with enough real authority and flexibility of judgment to resolve contract disputes over such working conditions."

However, OCAW concedes that "it is impossible to draw up a contract that anticipates every possible condition that may develop, particularly on working assignments."

One ICWW spokesman considers prearbitration "too informal" to be practicable.

But the high cost of arbitration, combined with the fact that union membership is dwindling and dues payments are off, is a relentless pressure forcing exploration of less-expensive grievance-handling methods. Arbitration may ultimately be reserved for the settlement of broad, far-reaching issues only.

Collective bargaining, Swanson observes, "in good faith, as the NLRB and the courts have so often held, presupposes that both the employer and the union enter into discussions with open and fair mind and sincere purpose to find a basis of agreement touching wages, hours and conditions of labor." In this framework, prearbitration would have ample room for growth.

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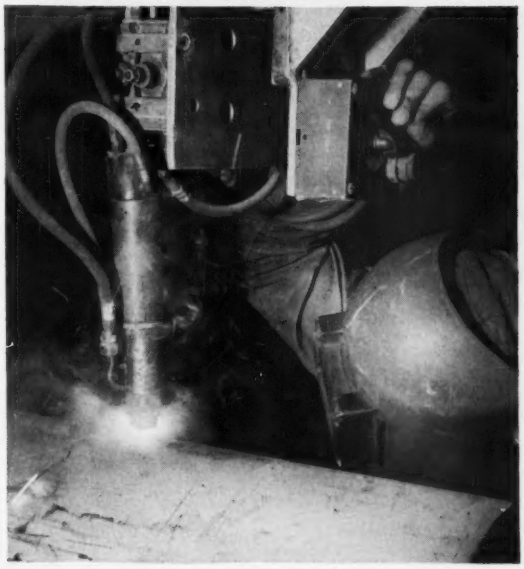

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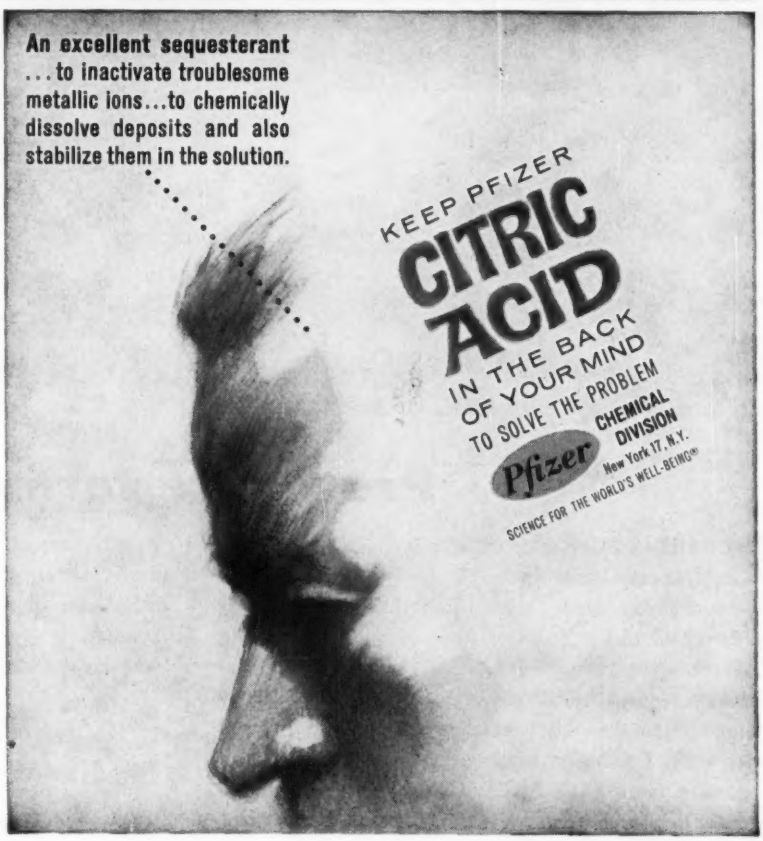
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"Eyewitness" each Friday reports in depth on the biggest news story of the week. Walter Cronkite is anchor man for the program, which represents Cyanamid's first venture in sponsorship of a continuing TV network show.

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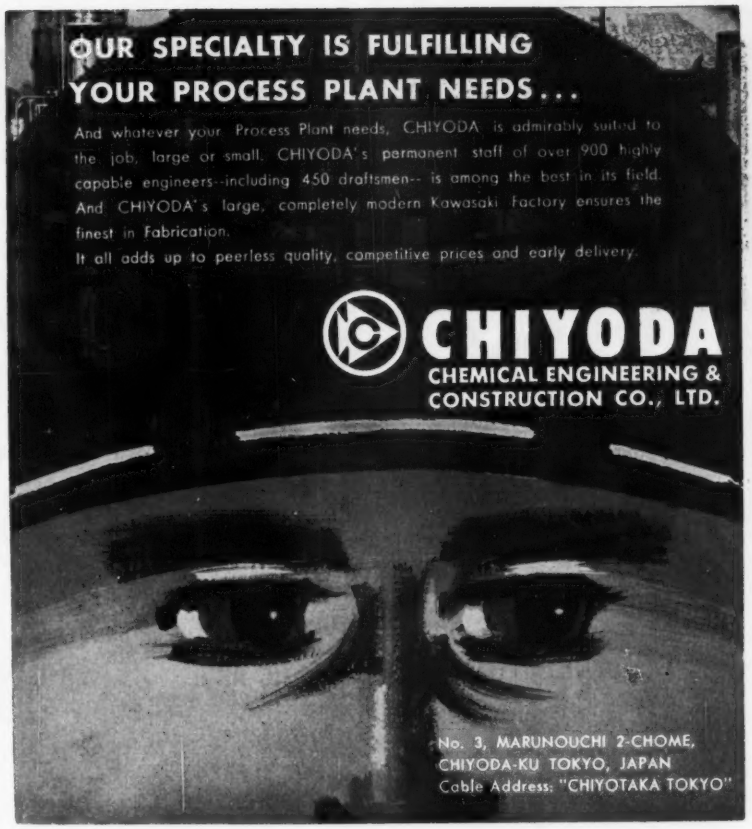
LABOR

Settlement: Representative of Oil, Chemical and Atomic Workers Local 8-434 have signed a new three-year contract with Monsanto Chemical Co. (El Dorado, Ark.), ending a two-month deadlock. Details of the new contract were not disclosed, but hourly wage increases of 9-11¢ were reportedly agreed upon. The contract, affecting 360 workers, calls for upgrading of several jobs at the plant, amounting to 15-19¢/hour wage hikes for workers involved, and for an 8¢/hour increase on July 1, '62 and 8¢/hour more on July 1, '63.

•

Back on Job: Gulf Oil Corp. (Philadelphia) has reinstated 103 members of OCAW's Philadelphia Local 12-646 who were discharged last June for refusing to cross picket lines set up by the National Maritime Union. OCAW contends the Gulf workers felt they should not cross a picket line set up by a sister union, although terms of the contract obliged them to do so. Gulf reinstated all but 25 workers, who were given additional disciplinary layoffs of two to six weeks, and dropped a $500,000 damage suit against the local and international unions.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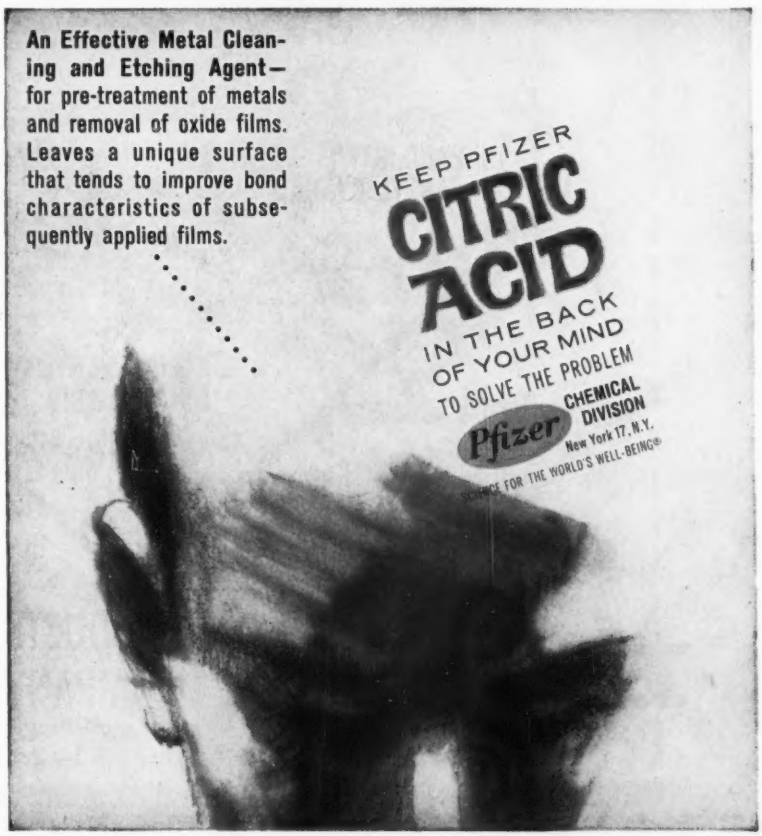
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$\quad\quad\quad

KEY CHANGES

Andrew Kaul III, chairman and chief executive officer of Speer Carbon Co., Inc., a subsidiary of Air Reduction Co., Inc., to the board of directors of Air Reduction.

J. W. Von Herbulis to president, Pittston Marine Corp. (Oradell, N.J.), subsidiary of The Pittston Co.

W. Thomas Swomley to vice-president in charge of finance, Eastern Stainless Steel Corp. (Baltimore).

Arch H. Rowan, Jr., to president, Fire Control Engineering Co. (Fort Worth, Tex.), manufacturer of dry chemical fire-fighting equipment.

Leroy Camel to vice-president, Detrex Chemical Industries, Inc. (Detroit), supplier of industrial chemicals and equipment.

Lester T. Moate to board of directors, American Steel Foundries (Chicago).

Robert K. Bissell to secretary, Brown Fintube Co. (Elyria, O.), manufacturer of heat exchange equipment.

William C. Osborne to vice-president (engineering and research) and board of directors, Research-Cottrell, Inc. (Bound Brook, N.J.), industrial air and gas cleaning manufacturer.

Robert O. Koch to vice-president and general counsel, Texas Gas Transmission Corp. (Owensboro, Ky.).

Paul A. Altpeter to controller, Allerton Chemical Co., Inc. and Brooks Research, Inc. (Rochester, N.Y.).

Gerald A. Busch to vice-president of marketing, Grand Central Rocket Co. (Redlands, Calif.).

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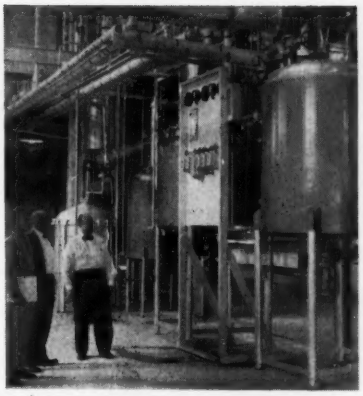
W. Horace Mason to vice-president and treasurer, Seiberling Rubber Co. (Akron, O.).

Clarence E Larson to vice-president and general manager of Oak Ridge operations, Union Carbide Nuclear Co. (Oak Ridge, Tenn.).

Charles E. McTiernan to vice-president (patents and licensing), Remington Rand Division, Sperry Rand Corp. (New York).



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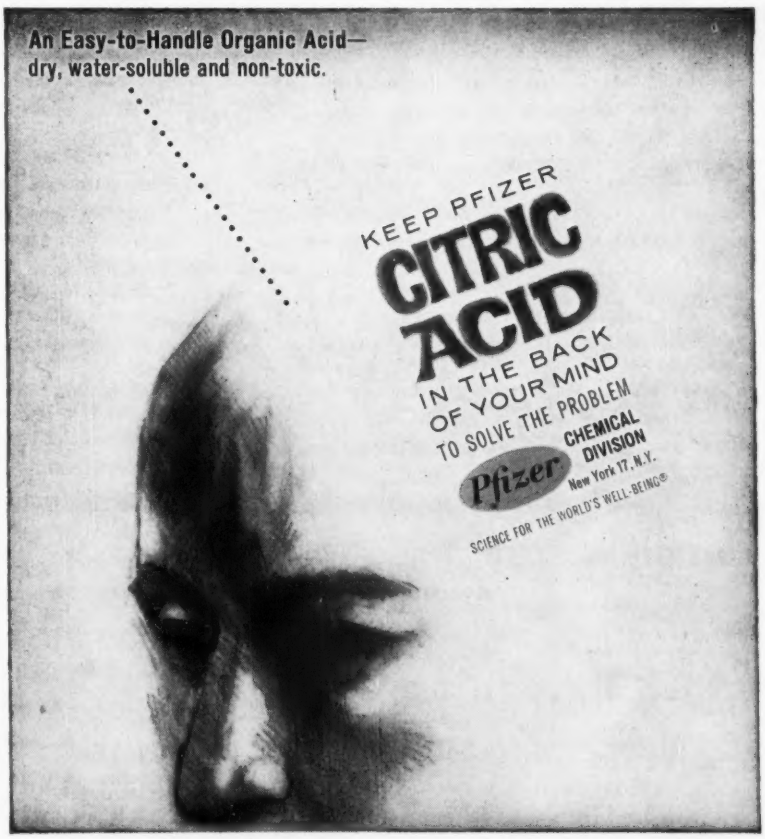

Chemical Week
ADVERTISERS' INDEX

ALLIED CHEMICAL CORP., NITROGEN DIV. Agency—G. M. Basford Co. 24

ALLIED CHEMICAL CORP., SOLVAY PROCESS DIV. Agency—Kastor, Hilton, Chesley, Clifford & Atherton, Inc. 2nd cover

AMERICAN CYANAMID CO., PROCESS CHEMICALS DEPT. Agency—Erwin Wasey, Ruthrauff & Ryan, Inc. 21

AMOCO CHEMICALS CORP. Agency—D'Arcy Advertising Co. 107

ANTARA CHEMICALS DIV. GENERAL ANILINE & FILM CORP. Agency—The House of Twiss 120

BAKER PERKINS, INC. Agency—Price, Tanner & Willox, Inc. 15

BEMIS BRO. BAG CO. Agency—Gardner Advertising Co. 88

BENDIX-COMPUTER DIV., THE BENDIX CORP. Agency—Shaw Advertising, Inc. 126

BENZOL PRODUCTS CO. Agency—The House of Twiss 128

CELANESE CHEMICAL CO. Agency—Ellington & Co., Inc. 93-94

CENTRAL ILLINOIS LIGHT CO. Agency—Becht & Blomeyer, Inc. Adv. 98

CHATTEM CHEMICALS Agency—Lookout Advertising Agency 129

CHEMICAL & INDUSTRIAL CORP. Agency—Strauchen & McKim Adv. 47

CHEMICAL SOLVENTS, INC. Agency—Asher, Rosston, Kremer, Inc. 123

CHIYODA CHEMICAL ENGINEERING & CONSTRUCTION CO., LTD. Agency—Meiji Tsushinsha Co., Ltd. 127

CLUPAK, INC. Agency—Lennen & Newell, Inc. 18

CONTINENTAL CAN CO. Agency—Batten, Barton, Durstine & Osborn, Inc. 115

CORNING GLASS WORKS Agency—The Rumrill Co., Inc. 28-29

COWLES CHEMICAL CO. Agency—The Bayless-Kerr Co. 34

CROWN ZELLERBACH CORP. Agency—Lennen & Newell, Inc. 122

DAWES LABORATORIES, INC. Agency—Don Kemper Co., Inc. 42

DIXON CHEMICAL & RESEARCH, INC. Agency—Ray Ellis Advertising 2

DOW CHEMICAL CO., THE Agency—MacManus, John & Adams, Inc. 8-9

DOW CORNING CORP. Agency—Church & Guisewite Adv., Inc. 116

DRAVO CORP. Agency—Ketchum, MacLeod & Grove, Inc. 64-65

DRACCO DIV. FULLER CO. Agency—The Jayme Organization, Inc. 1

EASTMAN CHEMICAL PRODUCTS, INC. Agency—Fred Wittner Co. 42-43

EMERY INDUSTRIES, INC. Agency—Farson, Huff & Northlich, Inc. 118-119

ENJAY CHEMICAL CO., DIV. OF HUMBLE OIL & REFINING CO. Agency—McCann-Erickson, Inc. 44

FRONTIER CHEMICAL CO. Agency—The McCormick-Armstrong Co. 82

GENERAL AMERICAN TRANSPORTATION CORP. Agency—Edward H. Weiss & Co. 12

GENERAL ANILINE & FILM CORP. Agency—Chirurg & Cairns, Inc. 13

GROSS & CO., INC., Agency—G. M. Basford Co. 22

HARCHEM DIV. WALLACE & TIERNAN, INC. Agency—Barber & Drullard, Inc. 91

HERCULES POWDER CO. Agency—Fuller & Smith & Ross, Inc. 80-81

HOOKER CHEMICAL CORP. Agency—The Rumrill Co., Inc. 63

INTERNATIONAL BUSINESS MACHINES CORP., DATA PROCESSING DIV. Agency—Marsteller, Rickard, Gebhardt & Reed, Inc. 6-7

INTERNATIONAL SALT CO., INC. Agency—Batten, Barton, Durstine & Osborn, Inc. 20

JEFFERSON CHEMICAL CO. Agency—Robinson-Gerard-McGary, Inc. 23

KAISER CHEMICALS, KAISER ALUMINUM & CHEMICAL SALES, INC. Agency—Young & Rubicam, Inc. 108-109

LUCIDOL DIV., WALLACE & TIERNAN, INC. Agency—Barber & Drullard, Inc. 90

METAL HYDRIDES, INC. Agency—Creamer-Trowbridge & Case, Inc. 10

MONSANTO CHEMICAL CO. Agency—Gardner Adv. Co. 17

MURRAY MFG. CO., D. J. Agency—R. C. Breth, Inc. 35-37

NATIONAL CARBON CO., DIV. OF UNION CARBIDE CORP. Agency—J. M. Mathes, Inc. 40

NATIONAL MARINE SERVICE, INC. Agency—Bozell Jacobs, Inc. 104

NOPCO CHEMICAL CO. Agency—Gray & Rogers Adv. 14

OLIN MATHIESON CHEMICAL CORP., ORGANIC CHEMICALS Agency—Van Sant Dugdale & Co., Inc. 112-113

ORONITE DIV. CALIFORNIA CHEMICAL CO. Agency—L. C. Cole Co. 4

PFAUDLER DIV., PFAUDLER PERMUTIT, INC. Agency—The Rumrill Co., Inc. 86-87

PFIZER & CO., CHAS. Agency—MacManus, John & Adams, Inc. 123, 125, 127, 129

PHILADELPHIA QUARTZ CO. Agency—The Michener Co. Adv. 114

PITTSBURGH DES MOINES STEEL CO. Agency—Downing Industrial Advertising 79

POWELL CO., THE WILLIAM Agency—The Ralph H. Jones Co. 38

QUAKER OATS CO. Agency—Headen, Horrell & Wentsel, Inc. 66

RESISTOFLEX CORP. Agency—Adams & Keyes, Inc., Adv. 124

ST. REGIS PAPER CO. Agency—Cunningham & Walsh,Inc. 100

SARCO COMPANY, INC. Agency—G. M. Basford Co. 48

SCIENTIFIC DESIGN CO. Agency—Michel Cather, Inc. 4th cover

SHARPLES CORP., THE Agency—The Aitkin-Kynett Co. 110

SHELL OIL CO. Agency—Ogilvy, Benson & Mather, Inc. 102

SILICONES DIV. UNION CARBIDE CORP. Agency—J. M. Mathes, Inc. 121

SINCLAIR PETROCHEMICALS, INC. Agency—Geyer, Morey, Madden & Ballard, Inc. 3rd cover

STANDARD STEEL CORP. Agency—The McCarty Co. 125

STANDARD STEEL WORKS, INC. Agency—James R. Reese Adv. Co. 16

TEKNIKA, INC. Agency—Robert E. Rolnik Assoc. 27

TEXAS NATIONAL BANK Agency—Goodwin, Dannenbaum, Littman, & Wingfield, Inc. 92

TOLEDO EDISON CO. Agency—Beeson-Reichert, Inc. 41

TRUBEK LABORATORIES, THE Agency—Ray Ellis Advertising 19

UNION CARBIDE CHEMICALS CO., DIV. OF UNION CARBIDE CORP. Agency—J. M. Mathes, Inc. 77

U.S. BORAX & CHEMICAL CORP., U.S. BORAX RESEARCH CORP. Agency—Howard M. Irwin & Assoc. 85

VOGT MACHINE CO., HENRY Agency—Farson, Huff & Northlich, Adv. 11

WYANDOTTE CHEMICALS CORP. Agency—Ross Roy, B.S.F. & D., Inc. 99, 101, 103

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European Chemical Co. has need for a consul- tant in Paint and Coating chemicals and resins. We demand process improvement new processes application know-how etc. Contact: Havas no 242/598 Rue Vivienne 17 Paris-(France).

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Shredder/Mixers, Baker-Perkins. Double sigma blades, screw tilt, 320 gal. cap., jacketed. Rosenthal, 1841 N. 2nd St., Phila. 22, Pa. RE 9-2816.

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Chemical Week

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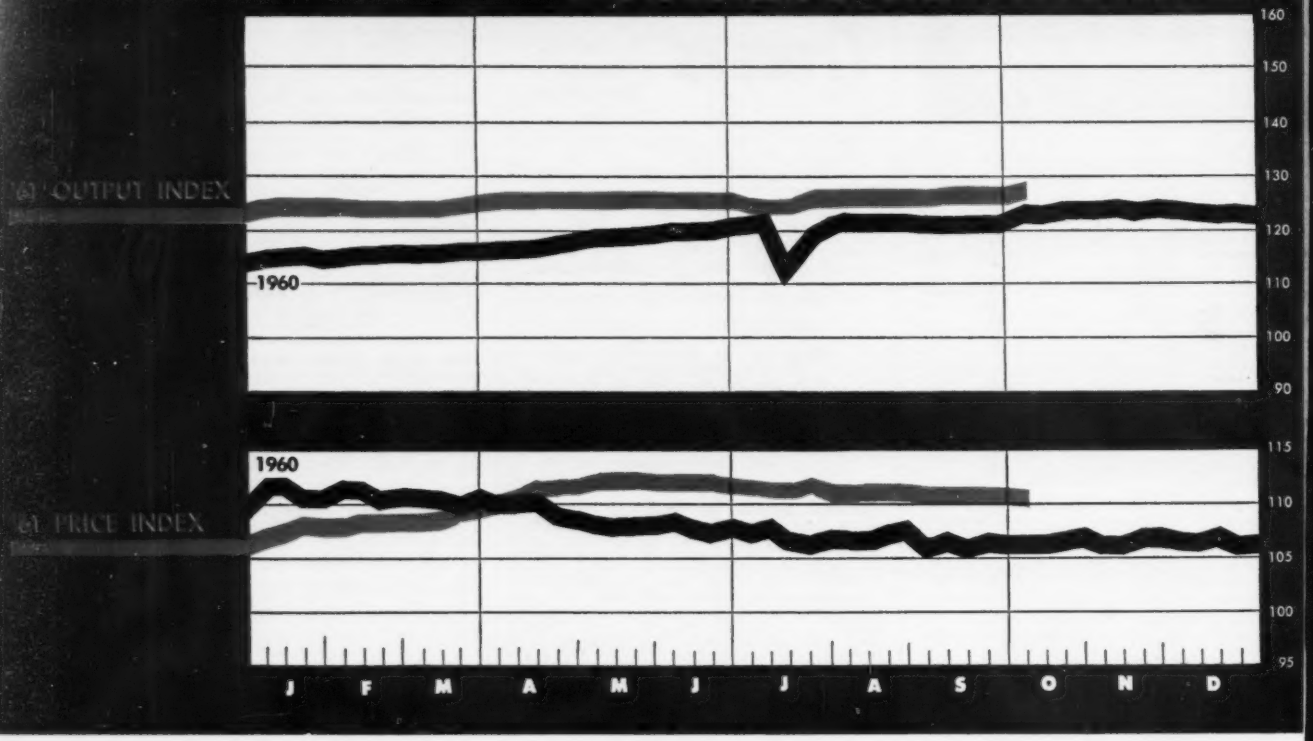
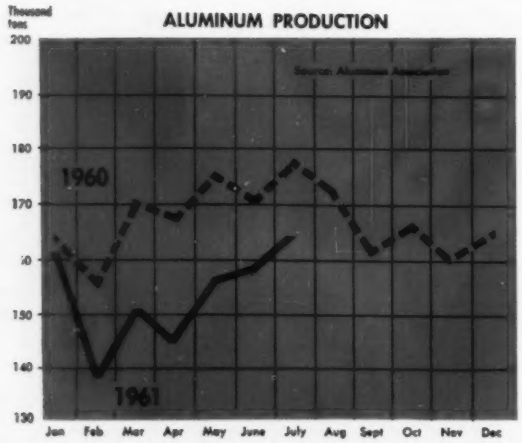


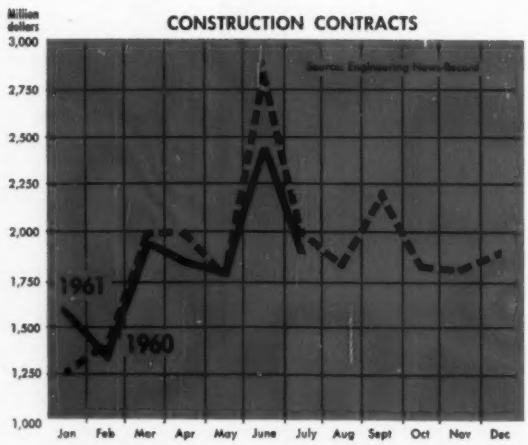
OCTOBER 7, 1961

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Chemical Week output index (1957=100)	126.1	125.8	124.5
Chemical Week wholesale price index (1947=100)	110.0	110.5	106.5
Stock price index (12 firms, Standard & Poor's)	53.78	54.80	44.43
Steel ingot output (thousand tons)	2,114	2,032	1,510
Electric power (million kilowatt-hours)	15,025	15,869	14,556
Crude oil and condensate (daily av., thousand bbls.)	7,145	7,111	6,877

WHOLESALE PRICE INDICATORS (1947-49=100)	Latest Month	Preceding Month	Year Ago
All commodities (other than farm and foods)	127.4	127.4	128.2
Chemicals and allied products	108.7	108.9	110.5
Industrial chemicals	120.8	121.1	124.6
Paint and paint materials	128.2	128.2	128.4
Drugs, pharmaceuticals and cosmetics	92.5	92.5	95.4
Fats and oils (inedible)	51.1	52.2	48.9
Fertilizer and materials	110.0	111.7	108.4

CHEMICAL CUSTOMERS CLOSE-UP





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EXCITING DEVELOPMENTS
FOR THE CHEMICAL INDUSTRY

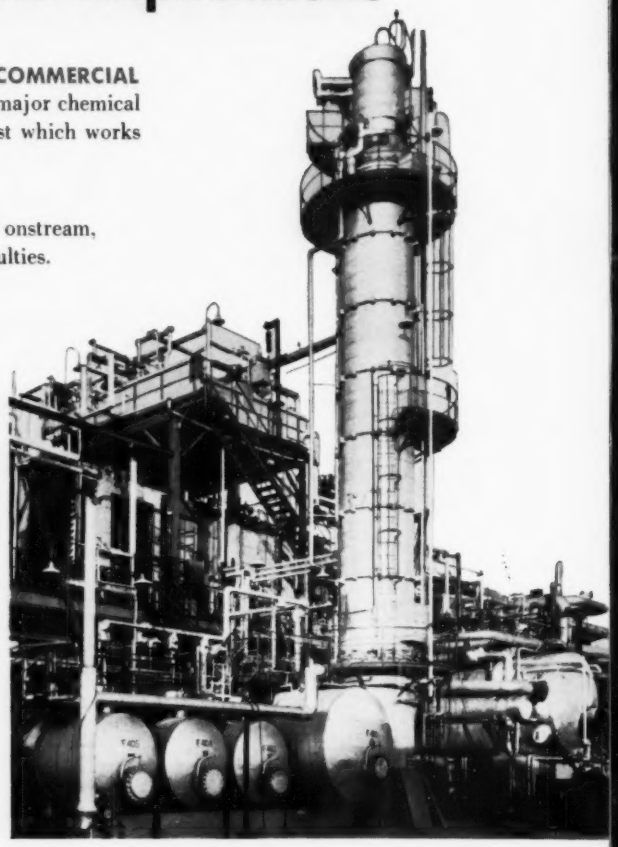
SCIENTIFIC DESIGN
increases its lead in Phthalic Anhydride from Ortho-Xylene and Naphthalene

SD'S UNIQUE ORTHO-XYLENE CATALYST IN COMMERCIAL OPERATION produces phthalic anhydride in plant of major chemical company, thus proving out this SD convertible catalyst which works equally well with ortho-xylene and/or naphthalene.

DUTCH STATE MINES places new SD phthalic plant onstream, achieving rapid, full startup with no operating difficulties.

FRANCOLOR (Compagnie Française des Matieres Colorantes) is nearing completion of an SD plant designed specifically to produce phthalic from ortho-xylene using SD's convertible catalyst.

WITCO'S phthalic anhydride plant in Chicago, Illinois, designed and built by SD, has been operating successfully for almost two years. A second plant for Witco Chemical Company is now under construction at Perth Amboy, New Jersey.



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